Annex O

Assessment of RP6 Network Investment Direct Allowances

Final Determination

30 June 2017



About the Utility Regulator

The Utility Regulator is the independent non-ministerial government department responsible for regulating Northern Ireland's electricity, gas, water and sewerage industries, to promote the short and long-term interests of consumers.

We are not a policy-making department of government, but we make sure that the energy and water utility industries in Northern Ireland are regulated and developed within ministerial policy as set out in our statutory duties.

We are governed by a Board of Directors and are accountable to the Northern Ireland Assembly through financial and annual reporting obligations.

We are based at Queens House in the centre of Belfast. The Chief Executive leads a management team of directors representing each of the key functional areas in the organisation: Corporate Affairs; Electricity; Gas; Retail and Social; and Water. The staff team includes economists, engineers, accountants, utility specialists, legal advisors and administration professionals.

Our Mission	Value and sustainability in energy and water.
Our Vision	We will make a difference for consumers by listening, innovating and leading.

Our Values

Be a best practice regulator: transparent, consistent, proportional, accountable, and targeted

Be a united team

Be collaborative and co-operative

Be professional

Listen and explain

Make a difference

Act with integrity

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1 Introduction

Key changes from the draft determination

1.1 In the draft determination, we proposed a reduction of £47.2m in funding to the proposals made by the company network investment direct allowances. In its response to the draft determination, the company accepted £26.1 m of the reduction we proposed to direct capital allowances. However, the company asked that we reverse £21.1m of the reductions and set out its reasons why it thought this was the result of errors in our assessment. Our response to the issues raised by the company is given in detail in this annex and summarised in Annex Q (NIE Networks consultation responses). Our assessment of direct capital investment has been updated to take account of on-going engagement with NIE Networks and the feedback provided in the company's response the draft determination.

1.2 The key changes from the draft to final determination, in respect of direct network investment, are:

i) The determination of additional direct capital allowances of £17.77m as a result of reviewing issues raised by the company in its response to the final determination.

ii) The reduction in some capital allowances included in the draft determination to reflect updated RP5 outcome data provided by the company, a reduction in capital allowances of £1.82 and a determination of pre-funded costs of £0.37m due to deferral of investment from RP5 to RP6.

iii) An increase in the direct capital allowance for trials to inform future investment decisions from £5.31m to £6.36m in response to issues raised by the company in its response to the draft determination. However, we have concluded that the company has not yet provided sufficient information to justify the selected trials and to set out a clear trial design. Therefore, we have included this category of investment in the re-opener mechanism.

1.3 We also undertook a review of the unit rates used in the draft determination to take account of the latest information on RP5 out-turn. We made adjustments to the final determination where this review revealed material changes in unit rates, although we did not increase unit cost rates unless the company had identified an error in its response to the draft determination.

1.4 Finally, we reviewed the latest estimate of RP5 outturn to determine if any outputs had been deferred from RP5 to RP6. We identified one item of output deferral relating to permanent flood protection at substations, resulting in a deduction of £0.37m in RP6 due to deferral of outputs from RP5. We will further review this assessment when the final out-turn figures for RP5 are available.

1.5 A detailed explanation of these changes is provided below. The changes to individual allowances are summarised in Table 1.1.

Investment category	Change to allowace	Adjustment £m
D07b - Refurbishment of 33kV overhead lines	Allowance for pole top safety inspections	0.114
D08b - Refurbishment of 11kV overhead lines	Allowance for pole top safety inspections	1.098
D09d - Undergrounding (landlocked poles)	Adjustment to reflect the latest information on historical costs	1.525
D10a - Undereaves	Adjustment to reflect the latest information on historical costs	0.217
D11a - Cut-outs	Change from Ofgem median rate for GB DNO's for NIE Networks historical rate, consistent with much of the determination.	0.403
D13a - Replace indoor switchgear (33kV)	Adjusted to reflect changes in specification identified by NIE Networks	0.596
D13b - Replace outdoor switchgear circuit breaker (33kV)	ditto	0.496
D13i - Civils work to primary substations	Reduced to reflect latest information on historical costs.	-0.400
D15b - Replace complete secondary switchgear.	Adjusted to reflect changes in specification identified by NIE Networks	1.486
D15c - Replace complete secondary switchgear and temporary switchgear works	ditto	0.379
D15h - H pole: replace LV cabinet	ditto	0.036
D43 - ESQCR	Adjusted rate for looped services Increased allowance to cover increased LV pole replacements as a result of new refurbishment specification	3.531
D50a - Flood protection of substations.	Deduction of a pre-funded amount for 3 substations protected in RP5 as part of complete substation replacement.	-0.369
D101 - Network alterations	Adjustment to reflect additional information and clarification of previous information by NIE Networks	2.013
D601 - 33KV Congestion	Allowance for two additional projects in the light of further informaiton provided by NIE Networks	1.521
D602 - Innovation	Inclusion of energy storage project	0.300
	Allowance for indirect costs	0.750
	Allowance for RTU replacement	1.950
D604 - Connections driven systems work	Adjustment to reflect additional information and clarification of previous information by NIE Networks	1.332
T10c - 110kV Switchgear	Adjustment to reflect the latest information on historical costs	0.246
T11e - 275kV Ancillaries - transformer bunding	A reduction in the unit rate based on the out-turn cost for RP5.	-0.360
T12 - 110kV Ancillaries		
T12d - Transformer bunding	ditto	-0.099
T12f - Generators	ditto	-0.099
T12h - DC standby systems	ditto	-0.140
T12i - AC system rewire	ditto	-0.013
T14c - Associated cable replacement	Reduced to reflect latest information on historical costs.	-0.923
Total		15.588

Table 1.1: Change in direct network investment from the business plan submission to the final determination

1.6 The combined change of these three areas of review from the draft determination to the final determination is summarised in Table 1.2.

1.7

Change to allowace	Adjustment £m
Issues raised by NIE Networks in response to the draft determination	17.774
Review of unit rates on latest information	-1.818
Pre-funded investment on account of deferrals	-0.369
Total	15.588

Table 1.2: Summary of changes to direct capex investment from the draft determination.

Overview

1.8 This Annex sets out our assessment of NIE Networks proposals for direct network investment which forms part of the overall capital investment proposed by the company for RP6.

1.9 Direct investments are those activities which involve physical contact with network system assets such as refurbishment or reinforcement of existing assets and the creation of new assets. Other strands of investment not covered in this section include indirect expenditure and metering.

1.10 Direct network investment is treated in one of three ways in this Price Control:

- investment for which an ex-ante allowance is included in this determination;
- investment carried out under the re-opener mechanism where an estimate has been included for costs which will be determined at a later date when the need for the project has been confirmed and the scope, cost and programme developed; and,
- investment in undereaves service replacement which is subject to a volume driver.

1.11 NIE Networks proposed direct investment in the distribution and transmission networks in RP6 of £446.5m in 2015/16 prices prior to the application of real price effects and on-going efficiencies. This included a number of items of investment which will be addressed in RP6 through re-opener mechanism or volume drivers (see Table 1.3):

Area of investment	NIE submission
Major transmission asset maintenance projects	£54.6m
Nominated distribution projects	£4.3m
LCT load related expenditure for the last three years of RP6	£10.5m
Investing in the future trials and innovation	£6.4m
Undereaves service replacement volume driven allowance	£8.2m

Table 1.3: Network investment subject to re-openers

1.12 Taking account of these we identified £376.0m of planned direct network investment in the company's submission for which we have we have now determined an amount of £336.4m. The movement from the company's business plan to the final determination is shown in Table 1.4 below.

	Distribution	Transmission	Total
NIE Networks Business Plan submission	342.1	104.4	446.5
Less nominated distribution projects (re-opener)	-4.3		-4.3
Less transmission asset replacement (re-opener)		-49.3	-49.3
Less load related LCT (reopener)	-10.5		-10.5
Less investing in the future (reopener)	-6.6		-6.6
Less undereaves volume driver	-10.0		
Business plan core investment net of estimates	310.7	55.1	365.8
UR adjustments to the core investment plan	-19.6	-9.8	-29.4
Final determination of core investment plan	291.1	45.3	336.4
Add back nominated distribution project estimate	4.3		4.3
Add back transmission asset replacement estimate		54.6	54.6
Add back for load related LCT reopener estimate	10.5		10.5
Add back investing in the future estimate	6.4		6.4
Add back undereaves volume driver estimate	8.2		8.2
Final determination estimate compatible with the company business plan submission.	320.5	99.9	420.3*

* Does not total due to rounding differences

Table 1.4: Change in direct network investment from the business plan submission to the final determination

1.13 For the remaining core investment, we have carried out a detailed assessment and challenge of the company's proposals, considering both the need for the work proposed, the scope of work proposed and estimated cost of the work. We have been assisted in this assessment by our technical consultants GHD whose experience covers the assessment and delivery of similar works in Northern Ireland, in GB and internationally.

1.14 We have concluded that an efficient cost of investment to maintain and develop the network as proposed by NIE Networks in its Business Plan is £420.4m before the application of real price effects and on-going efficiencies.

1.15 In this annex, all costs are reported in 2015/16 prices and before the application of real price effects and the application of on-going efficiencies

1.16 In addition to the work necessary to maintain and enhance the distribution and transmission networks, further work is expected to be identified in the future to improve the capacity or capability of the transmission network. This could be a material strand of investment but the scope, timing and costs of the work which will be done are highly uncertain. In the RP5 price control, efficient allowances for this type of work have been determined on a case by case basis as the work is confirmed. We intend to continue this approach in RP6. We have undertaken a preliminary assessment of the potential costs of this work, having taken advice from the Transmission Systems Operation (TSO) SONI which is described in Section 8.

Identification of allowances

1.17 The various distribution and transmission programmes and allowances have been identified by a numbering system and are shown in Tables 1.5 and 1.6 below.

Programme	Description
D06	Distribution Tower Lines
D07	33kV Overhead Lines
D08	11kV Overhead Lines
D09	LV Overhead Lines
D10	Undereaves
D11	LV cut-outs
D13	Primary Plant
D14	Primary Transformers
D15	Secondary Substations
D16	Distribution Cables
D39	SCADA
D41	Operational Telecoms network
D43	ESQCR - Distribution
D50	Distribution Substation Flooding Enforcement
D57	Distribution Network Reinforcement
D101	Network Alterations
D601	33kV Congestion
D602	Investing for the Future

Programme	Description
D603	Distribution Protection
D604	Connection Driven System Work
D605	Network Access & Commissioning

Table 1.5 – Distribution Programmes

Programme	Description
T06	Transmission Plant Switch Houses
T10	110kV Switchgear Replacement
T11	275kV Plant Ancillaries
T12	110kV Plant Ancillaries
T13	275kV/110kV Transformer Replacement
T14	110/33kV Transformers Replacement
T15	22kV Reactor Replacement
T16	Transmission Transformer Refurbishment
T17	275kV Overhead Line Asset Replacement
T19	110kV Overhead Line Asset Replacement
T20	Transmission Cables
T40	Transmission ESQCR
T602	Transmission Protection
T603	Network Access & Commissioning

Table 1.6 – Transmission Programmes

2 Distribution Asset Replacement and Refurbishment Expenditure

Plant Asset Replacement

D13 - Primary Plant – Primary Switchgear

D13 - Scope of work

2.1 Distribution primary plant covers the major electrical equipment located in 33/11kV substations. These substations can be either indoor with transformers and switchgear located in buildings or outdoor located in fenced sites.

2.2 The substations contain transformers which reduce voltage from 33kV to 11kV or 6.6kV and switchgear which is used to route power flow into or out of selected circuits or items of plant and to isolate faulty equipment or circuits.

2.3 Substations also contain ancillary equipment such as batteries and chargers and AC and DC substation supply systems, protection and telecommunication systems together with the substation infrastructure including fencing, security, access roads, foundations, cable trenches or ducts, drainage, oil bunds, oil water separators, lighting and heating and dehumidifiers

2.4 Replacement of primary transformers is covered under a separate programme (D14).

D13 - NIE Networks RP6 proposal

2.5 NIE Networks has set out its plans for investment in Primary Switchgear in Section 6.1 of its RP6 Network Investment Plan, beginning at paragraph 555. These plans are summarised in Table 2.1 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
33kV Indoor Switchgear	Each	36	137.665	4,955.940
33kV Outdoor Switchgear	Each	46	54.841	2,522.686
33kV Outdoor to Indoor Switchgear	Each	42	111.984	4,703.328
33kV Outdoor switchgear wood pole Mesh Replacement	Site	6	128.000	768.000
Primary switchgear (11kV & 6.6kV)	Each	200	46.586	9,317.200
Building refurbishment	Each	8	12.969	103.752
Civil works to primary substations	Each	40	40.000	1,600.000
Substation Site Costs	Lump sum			900.000
Rows below itemise RP6 sub-programmes for which there are no comparable RP5 costs or volumes				
Primary switchgear (11kV & 6.6kV) Retrofit	Each	57	23.894	1,361.958
Primary S/S DC System	Each	60	12.748	764.880

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Primary S/S rewire (inc. AC services panel)	Each	30	18.730	561.900
Plant Painting (primary)	Each	40	2.500	100.000
EFI replacement programme	Each	200	1.000	200.000
33kV Capacitor Bank	Each	2	148.288	296.576
11kV Capacitor Bank	Each	4	85.958	343.832
				28,500.052

Table 2.1 - NIE Networks proposed investment in Primary Switchgear

D13 – Draft determination

2.6 Although expenditure for 33kV switchgear is reported in the Network Investment RIGs, NIE Networks has reported very little completed volume data; hence we also used the RP5 Outturn Report (Section 3 of the RP6 Network Investment Plan) and the Business Plan Templates to assist us with developing our draft determination.

2.7 We accepted the volumes proposed by NIE Networks for all sub-programmes as we found the run-rates to be similar with those allowed in RP5.

2.8 We reduced the RP6 unit costs for the following items

- D13a: 33kV Indoor Switchgear
- D13b: 33kV Outdoor Switchgear
- D13c: 33kV Outdoor to Indoor Switchgear
- D13e: Primary Switchgear (11kV & 6.6kV)

2.9 D13a: 33kV Indoor Switchgear

i) NIE Networks forecasts that it will replace 39 units at a cost of £4,439k. We used this information to derive a unit cost of £113.83k

ii) During pre-draft determination engagement NIE Networks informed us that it had not taken into account the use of more expensive double bus-bar units in their RP5 forecast outturn figures stated above. It further informed us that 76% of the 33kV indoor switchgear installed in RP5 will be double bus-bar type; therefore, our initial assessment of RP6 allowances was incorrect.

iii) We re-examined the actual outturn costs reported in Network Investment RIGs for 33kV Indoor switchgear replacement and found that, to March 2016, NIE Networks has expended 67% of their RP5 allowance but has completed no outputs. Given the proportion of allowance expended to date we are left with no option than to assume that outturn expenditure includes double bus-bar switchgear, consequently, we were not convinced that the more expensive switchgear has been omitted from our analysis.

2.10 D13b: 33kV Outdoor Switchgear

i) NIE Networks forecasts that it will replace 23 units at a cost of £1,153k. We used this information to derive a unit cost of £50.13k

2.11 D13c: 33kV Outdoor to Indoor Switchgear

i) NIE Networks forecasts that it will replace 57 units at a cost of £5,566k. We used this information to derive a unit cost of £97.64k

2.12 D13e: Primary Switchgear (11kV & 6.6kV)

i) NIE Networks forecasts that it will replace 261 units at a cost of £11,511k. We used this information to derive a unit cost of £44.10k

D13 Final Determination

2.13 After reviewing NIE Networks response to our draft determination and the 5 year outturn data we maintained the volumes as stated in our draft determination and subsequently increased the allowances for 2 sub-programmes and reduced allowances for 2 sub-programmes

2.14 In its response to our draft determination NIE Networks stated that we "*failed to have regard to the latest available RP5 outturn data*" with respect to:

- D13a: 33kV indoor switchgear; and
- D13e: 11 & 6.6kV primary switchgear

2.15 We deal with the issues identified as "errors" by NIE Networks in turn.

33kV Indoor Switchgear

2.16 NIE Networks disagreed with our approach of basing the allowance on their forecast outturn data as this does not reflect their planned works for RP6[1].

i) We agree that the forecast data was not the most robust dataset but, at the time of writing the draft determination, we had no other local data available. We did compare NIE Networks forecast data to the GB DNO data provided to us by Ofgem and found NIE Networks costs to be acceptable.

ii) The 5 year outturn data submitted after publication of the draft determination contains more comprehensive information; hence, we have more confidence in basing our final determination on this dataset.

2.17 NIE Networks state that we have not taken account of the volume of more expensive double busbar equipment to be installed in RP6[2].

i) As with most of the equipment installed on the system, there are variations in cost depending on location and duty. Unless there are any special factors to

[1] Response to the Utility Regulator's Draft Determination, Annex 3.1, paragraph 3.20
[2] Response to the Utility Regulator's Draft Determination, Annex 3.1, paragraph 3.21

be taken into account, such as changes in technical specification, we base our determination on historical averages.

ii) NIE Networks installed a mix of single and double busbar equipment during RP5 and we have based our determination on the average outturn costs.

2.18 NIE Networks claim that some of the civil works associated with installation of switchgear have not yet been completed meaning the outturn costs submitted are not an accurate reflection of the actual costs incurred[3].

i) As switchgear replacement is a rolling programme and spans price control periods we would expect late RP4 costs to be included in early RP5 reporting. As such, any 5 year period should be reflective of average costs.

2.19 Having reviewed the latest data available we decided to increase the allowance for this sub-programme from £4.098m to £4.694m taking cognisance of a unit cost of £130.4k (increased from £113.8k)

11 & 6.6kV Primary Switchgear

2.20 NIE Networks disagreed with our approach of basing the allowance on their forecast outturn data as this does not reflect actual costs incurred and does not take account of the increase in materials costs[4].

i) Our draft determination was based on a mix of 4 year outturn and 1.5 year forecast data.

ii) The 5 year outturn data submitted after publication of the draft determination contains more comprehensive information; hence, we have more confidence in basing our final determination on this dataset.

iii) Our review of the 5 year outturn data supported only a marginal unit cost increase compared to our draft determination. NIE Networks subsequently provided data showing how the costs of installation of retrofit switchgear in RP5 had suppressed the outturn costs. As this task is identified in RP6 as a separate sub-programme in RP6, we decided to exclude the costs from the RP5 analysis.

iv) After we excluded the retrofit switchgear costs, our analysis still demonstrated a unit cost lower than that of NIE Networks proposal. NIE Networks informed us that it is increasing the X/R rating of new switchgear to take account of the effects of embedded generation on the system. We accepted this as sufficient justification for an increase in the allowance.

v) Having taken into account all of the above information we decided to increase the allowance for this sub-programme from £8.820m to £9.317m taking cognisance of a unit cost of £46.6k (increased from £44.1k)

[3] ibid. Annex 3.1, paragraph 3.22
[4] ibid, Annex 3.1, paragraph 3.23

Other Changes

2.21 In addition to the changes requested by NIE Networks, our review of the 5 year outturn data also identified reductions in allowances for D13i: civil works to primary substations

2.22 We took the 5 year outturn data for this sub-programme and extrapolated for RP6 price control duration. This calculation provided reduction of £0.4m

2.23 NIE Networks RP6 proposal and our draft & final determinations of direct allowance in RP6 for Primary Switchgear is shown in Table 2.2 below (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D13a	Replace indoor switchgear (33kV)	4,955.940	4,098.060	4,693.716
D13b	Replace outdoor switchgear - circuit breaker (33Kv)	2,522.686	2,306.118	2,306.118
D13c	Replace outdoor switchgear - complete mesh (with indoor switchboard)	4,703.328	4,101.006	4,101.006
D13d	Replace outdoor switchgear - mesh equipment (33kV)	768.000	768.000	768.000
D13e	Replace primary switchgear (33kV, 11kV & 6.6kV)	9,317.200	8,820.800	9,317.200
D13h	Building refurbishment	103.752	103.752	103.752
D13i	Civil works to primary substations	1,600.000	1,600.000	1,200.000
D13j	Primary substation lease renewal	900.000	900.000	900.000
D13k	Replace primary switchgear (11kV & 6.6kV) retro-fit	1,361.958	1,361.958	1,361.958
D13l	Refurbish primary S/S DC system	764.880	764.880	764.880
D13m	Rewire primary S/S (inc. AC services panel)	561.900	561.900	561.900
D13n	Plant painting (primary)	100.000	100.000	100.000
D13o	Replace earth fault indicator	200.000	200.000	200.000
D13p	Install 33kV capacitor bank	296.576	296.576	296.576
D13q	Install 11kV capacitor bank	343.832	343.832	343.832
D13 Total		**28,500.052**	**26,326.882**	**27,018.938**

Table 2.2 - Direct investment in Primary Switchgear

D14 – Primary Plant - Primary Transformers

D14 - Scope of work

2.24 Transformers are used at substations to step the system voltage either up or down.

2.25 NIE Networks classify its 33kV substations as “primary” substations; hence, the power transformers located at these substations are called “primary transformers”.

2.26 Generally, primary transformers are used to step 33kV down to 11kV (or 6.6kV in certain parts of Belfast).

2.27 Transformers tend to become electrically and mechanically unstable as they age.

i) The windings can move and become loose due to the constant vibrations caused by the transformation process

ii) The paper insulation around the windings degrades and becomes less effective.

iii) The oil which provides electrical insulation and cooling becomes contaminated

2.28 Even with good maintenance programmes transformers have a finite service life but it is not good practice to run primary transformers to failure given the potential health and safety issues associated with a catastrophic failure.

D14 - NIE Networks RP6 proposal

2.29 NIE Networks has set out its plans for investment in Primary Transformers in Section 6.1 of its RP6 Network Investment Plan beginning at paragraph 646. These plans are summarised in Table 2.3 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Replace 33/11kV Transformer (up to 6.25MVA)	Each	14	185.613	2,598.582
Replace 33/11kV Transformer (up to 12.5MVA)	Each	2	228.700	457.400
Replace 33/11kV & 33/6.6kV Transformer (up to 18.75MVA)	Each	14	273.543	3,829.602
Procure Spare 33/11kV Transformer (15/18.75MVA)	Each	2	175.525	351.050
Transformer refurbishment	Each	6	80.000	480.000
				7,716.634

Table 2.3 – NIE Networks proposed investment in Primary Transformers

D14 – Draft determination

2.30 NIE Networks has provided a supporting annex, describing the asset and providing brief details of the condition and performance of the equipment, in support of the needs case for investment. We used this information together with NIE Networks forecast outturn report and annual RIGs reporting to determine run rates and unit costs.

2.31 With the exception of procuring spare transformers we accepted the volumes proposed by NIE Networks for all sub-programmes as we found the run-rates to be lower than RP5.

2.32 We also accepted the unit costs proposed by NIE Networks as these are lower than RP5 outturn costs.

2.33 We disallowed the procurement of spare transformers as we were not convinced that they were required given the mitigation of risk provided by the volume of transformers being procured during RP6 for business-as-usual replacement. Furthermore, NIE Networks managed network risks during RP5 price control period without the need to purchase spare transformers.

D14 Final Determination

2.34 NIE Networks made no comment on our draft determination and we have made no revisions for the final determination.

2.35 NIE Networks RP6 proposal and our draft & final determinations of direct allowance in RP6 for Primary Transformers are shown in Table 2.4 (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D14a	Replace 33/11kV Transformer (up to 6.25MVA)	2,598.582	2,598.582	2,598.582
D14b	Replace 33/11kV Transformer (up to 12.5MVA)	457.400	457.400	457.400
D14c	Replace 33/11kV or 33/6.6kV Transformer (up to 18.75MVA)	3,829.602	3,829.602	3,829.602
D14g	Transformer Refurbishment	480.000	480.000	480.000
D14 Total		**7,365.584**	**7,365.584**	**7,365.584**

Table 2.4 – Direct investment in Primary Transformers

D15 – Secondary Plant - Secondary Substations

D15 - Scope of work

2.36 Investment in this category relates to the replacement or refurbishment of secondary substation plant. The scope of assets within this investment category covers all types of 6.6/0.4kV and 11/0.4kV substations that contain high voltage equipment together with the associated low voltage equipment. This may be either located in a cabinet or be wall mounted, open terminal.

2.37 The smaller transformers may be pole mounted and could supply only one customer while others may feed up to 100 customers. Smaller transformers will be mounted on a single pole while some larger transformers may be mounted on an H-pole or a 4-pole structure.

2.38 The largest substations will be ground mounted located in either a brick building or a fibre glass or steel enclosure. These substations can supply up to 500 customers. In some instances, one or more secondary substations may supply a single commercial or industrial premise.

2.39 The most common form of high voltage switchgear is a ring main unit (RMU) consisting of 3 switching devices, two of which control the flow of power in the main circuit while the third device switches power to the transformer.

D15 - NIE Networks RP6 proposal

2.40 For each of the asset categories described in the above table NIE Networks provided a supporting annex describing the asset and providing brief details of the condition and performance of the equipment, in support of the needs case for investment.

2.41 For substation and RMU replacements, the main driver for investment is the age and condition of the equipment – a number of RMUs are subject to operational restriction. Recorded numbers of catastrophic failures have risen, due to age and condition related defects. Outdoor equipment is more susceptible to failure due to corrosion and moisture ingress. Approximately 18% of equipment was installed between 1956 (60 years old) and 1976 (40 years old).

2.42 The majority of secondary switchboards contain Reyrolle B and C switchgear installed between 1940s and early 1970s (located indoors). Asset condition assessments have identified age and condition related deterioration and defects. There is an increased maintenance burden and the lack of spare parts from the original equipment manufacturers also present a risk, together with the increased risk to operators due to ongoing deterioration of equipment.

2.43 For ground mounted transformers fed from HV overhead lines, the main drivers relate to the transformers being subject to corrosion, moisture ingress and oil leaks. In addition, the wood pole and associated equipment (including steel work and LV kiosk) is in poor condition and in some cases does not comply with current standards.

2.44 For transformer substations mounted on 4-pole structures, the replacement need is based on the general deterioration of the main components associated with the substation; the wooden LV kiosks are susceptible to acute decay and the structures are generally located in public areas – posing a greater risk to the public. The risk analysis process has identified 225 existing 4-pole structurers classed as high priority for intervention.

2.45 Low voltage mini pillars are generally located in open public areas, often adjacent to customer's premises and are subject to age-related deterioration of pillar walls and doors. In addition, they are susceptible to third party interference and present a safety risk due to the possible exposure of live equipment to members of the public and possible failure of plant resulting in explosion and risk to the safety of operational staff.

2.46 NIE Networks has set out its plans for investment in Secondary Substations in Section 6.1 of its RP6 Network Investment Plan beginning at paragraph 660. These plans are summarised in Table 2.5 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Replace RMU	Each	80	7.772	621.786
Replace complete S/S	Each	395	37.061	14,639.142
Replace complete S/S and temporary S/S works	Each	50	51.679	2,583.962
Replace Secondary Switchboard	Each	110	41.482	4,562.996
Replace OH fed GMT	Each	66	25.125	1,658.253
Replace H pole S/S	Each	72	13.410	965.552
Replace H pole Transformer	Each	10	4.500	45.000
Replace H pole mounted LV cabinet	Each	40	4.600	184.000
Replace 4-pole structure	Each	225	22.917	5,156.391
Repair 4-pole structure defects	Each	20	2.350	47.000
Replace sectionaliser	Each	55	11.618	638.990
Replace mini pillar	Each	1,035	3.389	3,507.615
Replace LV wall mounted fuse board	Each	50	13.509	675.445
Secondary Substation Ancillary Works	Lump Sum			2,000.000
Replace 4-pole structure mounted LV cabinet	Each	20	5.015	100.300
Refurbish LV plant	Each	20,914	0.156	3,260.490
Refurbish Substation LV cabinet	Each	30	4.050	121.500
Repair ABB LV cabinet	Each	800	0.750	600.000
RMU Substation - Mini Kiosk	Each	50	47.577	2,378.850
Refurbish 11kV GVS sectionaliser	Each	80	3.000	240.000
Secondary other	Lump Sum			435.000
Voltage Regulators	Each	3	44.914	134.743
				44,557.015

Table 2.5 – NIE Networks proposed investment in Secondary Substations

D15 – Draft determination

2.47 Through the Q&A process and a series of meetings with NIE Networks staff, we sought clarifications on a number of points relating to the RP6 programme for secondary plant. In general terms, our clarifications focused on obtaining more robust information to support the RP6 investments for certain sub-programmes (fault data, performance and condition data) and explanations regarding differences in implied asset lives (relative to Ofgem CNAIM asset lives) and unit costs (relative to RP5 outturn).

2.48 For the majority of the sub-programmes included within D15, the RP6 plan to address the asset risk and performance involves a continuation of previously established replacement/refurbishment programmes progressed in RP5 (and in some cases in RP4).

2.49 We carried out an assessment of the volume ("run-rate") of asset replacement/refurbishment works proposed by NIE Networks during the RP6 period for each of the sub-programmes and compared them against the NIE Networks RP5 forecast outturn run rates. In general, we have observed a reduction in proposed RP6 run rates across most of the sub-programmes, with the exception of RMU replacement (2.6% increase) and H-pole LV cabinet replacement (53.8% increase). Based on the low volumes of these sub-programmes, these differences are not considered material.

2.50 We have also carried out modelling of the asset replacement volumes using NIE Networks asset age profiles and industry accepted asset lives (as stated within Ofgem's CNAIM) for each of the secondary plant asset categories to determine modelled outputs for RP6. We compared these modelled outputs with the NIE Networks proposed volumes for RP6 based on their condition based assessment, for which implied asset lives can be determined from the asset replacement model.

2.51 This comparison identified there are no asset categories where NIE Networks has assigned an asset life that is greater than the Ofgem CNAIM lives; for two of the categories, the NIE Networks asset lives are aligned to the Ofgem CNAIM lives; for the remaining nine categories, the NIE Networks asset lives are lower than the Ofgem CNAIM lives. As a consequence of using shorter asset lives, the NIE Networks RP6 replacement volumes are higher than the modelled volumes.

2.52 We also carried out a qualitative assessment of the information provided by NIE Networks to support the RP6 run-rates based on their condition assessment for each of the asset categories. Following this assessment we concluded that the requested volumes for RP6 are appropriate.

2.53 To supplement the analysis above relating to proposed run rates for RP6 (compared to RP5), we also carried out a comparison of the unit cost movement across RP5 and RP6 for each of the asset categories.

2.54 Following our initial review of the RP5 and RP6 unit costs and further Q&A on unit cost increases in certain categories, NIE Networks provided an update on RP5 unit

costs (Oct 16) based on more up-to-date information available to NIE Networks. It was observed that there are five of the sub-programmes where there is no material movement (or indeed a reduction) in unit costs; for the other seven sub-programmes, the RP6 unit costs proposed by NIE Networks are higher than the forecast unit costs during RP5.

2.55 We requested NIE Networks provide further explanation in support of the proposed increase in unit costs for RP6. In its response, NIE Networks provided an explanation of the main drivers resulting in an increase in RP6 unit costs. For replacement substation works, NIE Networks itemised the main drivers affecting unit costs:

- Increased transformer costs driven by Eco directive;
- Enhanced LV cabinet specification to address recent corrosion issues; and
- Increased substation shell costs associated with new civil contract.

2.56 We would expect the updated (increased) RP5 unit costs for replacement substation works to include sufficient provision for these cost increases and we do not consider it will provide sufficient incentive to NIE Networks to deliver RP6 investment plan efficiently if further increases in unit costs were allowed. We therefore determined allowances for RP6 based on the latest RP5 outturn unit costs.

2.57 For secondary switchboards, NIE Networks clarified that the RP5 unit cost had been derived from a single project consisting of five panels of secondary switchgear, whilst the RP6 unit cost is a "blended rate" based on a more detailed assessment of replacement needs using either primary CB panels, secondary CB panels or RMUs. Via the Q&A process, we sought additional details of the RP5 programme for secondary switchboard replacement (consisting of 15 switchboard replacements) and NIE Networks provided details of the costs for each individual project.

2.58 Our analysis of these costs confirmed that the NIE Networks unit costs for RP6 relating to RMUs and primary CB panels were broadly consistent with RP5 costs. We noted that the RP5 unit cost for secondary CBs was lower than the RP6 unit cost and therefore we recommend RP6 allowances based on the lower unit cost.

D15 Final Determination

2.59 After reviewing NIE Networks response to our draft determination, the 5 year outturn data and after further discussions with NIE we subsequently increased the allowances for 3 sub-programmes.

2.60 In its response to our draft determination NIE Networks consider that we made an error in our approach in relation to:

- Substation replacement
- Substation replacement including use of a temporary substation; and
- H-pole mounted LV cabinets

2.61 NIE Networks submits that RP5 outturn costs alone are not a sufficient basis for determining the RP6 allowance. There are three distinct costs drivers that will increase unit costs for RP6 that were not a feature in RP5, namely:

i) increased transformer costs driven by the requirements of the Eco Directive - £516 per unit;

ii) enhanced LV cabinet specifications - £1.81k per unit; and

iii) increased substation shell costs - £1.78k per unit.

2.62 In its response to the draft determination, NIEN has also clarified that the RP5 outturn unit costs do not reflect any of the cost drivers that will impact on RP6 unit costs. This is because:

i) the more expensive Eco Directive compliant transformers are not yet in use as RP5 replacements have been completed by utilising existing stock pre-dating the implementation of the Eco Directive;

ii) the procurement exercise for the enhanced LV cabinets has only recently completed; and

iii) the procurement exercise for substation shells is currently at an advanced stage, but is not yet complete. NIE Networks anticipates that this procurement exercise will compete in June 2017.

2.63 Based on clarifications provided in NIEN's response, it is evident that the RP5 outturn costs do not include provision for costs relating to these additional cost drivers. It is therefore reasonable to make provision for these within RP6 unit costs, assuming that the NIEN procurement exercise has been carried out on an economically efficient basis.

2.64 We therefore recommend making an adjustment to the proposed RP6 unit costs for these categories, such that they are consistent with the values proposed by NIE Networks in its Network Investment Plan.

2.65 NIE Networks RP6 proposal and our draft & final determinations of direct allowance in RP6 for secondary substations are shown in Table 2.6 (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D15a	Replace RMU	621.760	621.760	621.760
D15b	Replace complete S/S	14,639.095	13,153.500	14,639.095
D15c	Replace complete S/S and temporary S/S works	2,583.950	2,205.000	2,583.950
D15d	Secondary Switchboard Replacement	4,563.020	3,454.000	3,454.000
D15e	Replace OH fed GMT	1,658.250	1,658.250	1,658.250
D15f	Replace H pole S/S	965.520	965.520	965.520
D15g	H pole: TX change only	45.000	45.000	45.000
D15h	H pole: replace LV cabinet	184.000	148.000	184.000
D15i	Replace 4 pole structure	5,156.325	5,156.325	5,156.325

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D15j	Repair 4 pole structure defects	47.000	47.000	47.000
D15k	Replace sectionalisers	638.990	517.000	517.000
D15l	Replace mini pillars	3,507.615	3,507.615	3,507.615
D15n	Replace LV wall mounted fuse board	675.450	675.450	675.450
D15o	Secondary Substation Ancillary Works	2,000.000	2,000.000	2,000.000
D15p	4 pole structures - LV cabinet change	100.300	100.300	100.300
D15q	LV plant- refurbishment	3,262.584	3,262.584	3,262.584
D15r	Substation LV cabinet refurbishment	121.500	121.500	121.500
D15s	ABB LV cabinet repairs	600.000	600.000	600.000
D15t	RMU Substation - Mini Kiosk	2,378.850	2,378.850	2,378.850
D15u	11kV GVS sectionaliser refurbishment	240.000	240.000	240.000
D15v	Secondary other	435.000	435.000	435.000
D15w	Voltage Regulators	134.742	134.742	134.742
D15 Total		**44,558.951**	**41,427.396**	**43,327.941**

Table 2.6 – Direct investment in Secondary Substations

D11 – Secondary Plant – Cut-outs

D11 - Scope of work

2.66 The majority of LV service cables to consumer premises are terminated in a house service cut-out with a fuse which is located before the meter and the subsequent customer's consumer unit/fuse board. The cut-out fuse provides protection against overload of the service and provides back-up fault protection to the meter and customer's installation.

2.67 The types of cut-out replacement undertaken are:

- Simple – Only the cut-out is replaced
- Complex – Partial replacement of service cable required to allow cut-out replacement

2.68 The mix of works proposed by NIE Networks is 90% simple and 10% complex cut-out replacement.

D11 - NIE Networks proposal

2.69 NIE Networks has set out its plans for investment in cut-outs in Section 6.1 of its RP6 Network Investment Plan beginning at paragraph 704. These plans are summarised in Table 2.7 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Replace house service cut-outs	Each	10,400	0.317	**3,296.800**

Table 2.7 – NIE Networks proposed investment in cut-outs

2.70 We accepted the volume proposed by NIE Networks as this is in keeping with RP5 run-rates.

2.71 We found the proposed unit cost to be high when compared to RP5 outturn and the industry median unit cost calculated by Ofgem.

2.72 During pre-draft determination engagement NIE Networks stated that it did not replace as many complex cut-outs in RP5 as envisaged hence their outturn unit cost was low. They further stated that they expect to carry-out 10% complex replacements during RP6 and; therefore, require increased funding

2.73 We were not convinced by NIE Networks' case for increased funding and are concerned that should it receive a higher level of funding it could again choose to deliver less complex replacements during RP6.

2.74 We based our draft determination on the industry median unit cost as determined by Ofgem for the GB DNOs.

D11 - Final Determination

2.75 In its response to our draft determination NIE Networks stated that we "*failed to take account of the nature and scope of the work*". We deal with the issues identified as "errors" by NIE Networks in turn.

2.76 NIE Networks stated that we were in error to use the Ofgem 'expert view' as a comparison cost. Further, the combined DPCR5/RIIOED1 industry median cost is £225[5].

i) In the file named "Asset replacement supporting file-20141120-1_7" column J "DPCR5+RIIO-ED1" industry median cost is £0.197k

ii) Column K of the same file is the "Expert view" and is the same value as above

iii) We inflated the value from 12/13 price base to 15/16 price base and arrived at the draft determination figure of £0.208k

2.77 NIE Networks stated that we were in error to rely on the GB DNO data supplied by Ofgem as this does not take into account the additional costs of 'complex' cutout replacements[6].

[5] Response to the Utility Regulator's Draft Determination, Annex 3.1, paragraph 2.49
[6] ibid, Annex 3.1, paragraphs 2.50 & 2.51

i) We are of the opinion that the 'complex' cutout replacement is not peculiar to Northern Ireland and that all GB DNOs will incur similar costs, therefore the cost and volume data will reflect the average cost of all types of cutout replacement.

2.78 NIE Networks stated that we have failed to have regard for the way in which cutout volumes are determined[7].

i) For RP5, NIE Networks were funded to replace 8,800 cutouts of which 10% would be 'complex' type. NIE Networks stated[8] that they will replace approximately 2% complex type during RP5.

ii) Given NIE Networks' failure to deliver the cutout replacement programme as planned, allowing funding to repeat the process is not in the public interest.

2.79 Notwithstanding the above comments and in keeping with our principle of basing our determination on outturn data wherever possible (using the GB DNO data as a sense check) we decided to revise our draft determination.

2.80 We are therefore content to allow the RP5 outturn average unit cost of £246.72 for cut-out replacement.

2.81 NIE Networks RP6 proposal and our draft & final determinations of direct allowance in RP6 for house service cut-out replacement are shown in Table 2.8 (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D11a	Replace house service cutouts	**3,296.800**	**2,163.200**	**2,565.888**

Table 2.8 – Direct investment in house service cut-outs

[7] ibid, Annex 3.1, paragraphs 2.52, 2.53 & 2.54
[8] ibid, Annex 3.1, paragraph 2.53

Overhead Line Asset Replacement

D06 Distribution Tower Lines

D06 - Scope of work

2.82 The majority of the 33kV overhead system is supported on wood poles; however, NIE Networks operate 28 circuits supported on steel towers. Most of the steel tower lines are double circuit and were originally designed to operate at 110kV or 69kV. The tower lines were installed between early 1930's and early 1970's.

2.83 Some of the circuits originally operated at a higher voltage but, due to operational requirements, were down-graded to run at 33kV as an economical alternative to being replaced with wood pole lines. Other circuits were over-designed with a view to upgrading to a higher voltage in the future if required.

2.84 It is now extremely unlikely that NIE Networks would upgrade any of the 33kV tower lines to a higher voltage[9]. However, there is a requirement to maintain the existing towers in a safe and serviceable condition.

2.85 NIE Networks undertook a cost benefit analysis which determined that maintaining the existing tower lines was the most economical option when compared with dismantling and rebuilding with wood poles.

D06 - NIE Networks RP6 proposal

2.86 NIE Networks has set out its plans for investment in Distribution Tower Lines in Section 6.2 of its RP6 Network Investment Plan beginning at paragraph 736. These plans are summarised in Table 2.9

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Re-conductor Double Circuit including earthwire	Span	103	26.450	2,724.350
Refurbishment	Lump Sum			1,056.130
				3,780.480

Table 2.9 – NIE Networks proposed investment in Distribution Tower Lines

2.87 We queried the conductor condition assessment data in NIE Networks' initial submission as we were not convinced that sufficient justification existed for the proposed replacement sub-programmes. NIE Networks subsequently provided new data and revised sub-programmes. These are summarised in Table 2.10

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Re-conductor Eden Main - Carrickfergus	Span	33	26.450	872.850

[9] SONi do not have any upgrading projects in their 10 Year Transmission Forecast Statement

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Refurbish Finaghy – Sprucefield - Lissue DC OHL	Span	66	8.150	537.900
General Refurbishment	Lump Sum			1,056.13
				2,466.880

Table 2.10 – NIE Networks revised proposed investment in Distribution Tower Lines

D06 – Draft determination

2.88 No historical data exists with which to compare re-conductoring works so we used the industry median unit cost data prepared by Ofgem.

2.89 We found the proposed re-conductoring costs to be high when compared to Ofgem data but NIE Networks subsequently explained that their scope of work also included an element of tower refurbishing. When we included the additional scope in the analysis we found the proposal to be acceptable.

2.90 The unit costs involved in general refurbishment are lower than the Ofgem industry median costs; therefore we find the proposal to be acceptable.

2.91 We saw no benefit in separating the Finaghy – Sprucefield – Lissue circuits from the other general refurbishment projects as the scope of work is almost identical.

D06 - Final Determination

2.92 NIE Networks did not comment on our draft determination of this programme.

2.93 We reconsidered out draft determination decision to aggregate all refurbishment tasks into a single sub-programme. For the final determination we will disaggregate the named refurbishment task from the general tasks. This will provide more transparency in the reporting of outputs.

2.94 NIE Networks RP6 proposal and our draft & final determinations of direct allowance in RP6 for distribution towers are shown in Table 2.11 (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Cost (£k)	FD Cost (£k)
D06a	Re-conductor Eden Main - Carrickfergus North	872.850	872.850	872.850
D06b	Refurbish Finaghy-Sprucefield-Lissue DC OHL	537.900	537.900	537.900
D06c	General Refurbishment	1,056.130	1,056.130	1,056.130
D06 Total		**2,466.880**	**2,466.880**	**2,466.880**

Table 2.11 – Direct investment in Distribution Tower Lines

D07 Distribution 33kV and D08 11kV Wood Pole Overhead Lines

D07 and D08 - Scope of work

2.95 These allowances are to fund the replacement and refurbishment of the 33kV and 11/6.6kV overhead line networks due to age and condition.

2.96 NIE Networks' 11kV overhead network (approximately 21,000km) consists of main lines that form the "backbone" of the network and spur lines that radiate from these main lines. Main lines make up around 40% of the 11kV network of which a substantial proportion was constructed between the late 1950's to the mid 1970's.

2.97 Whilst the present 11kV overhead line design standard is 50mm^2 All Aluminium Alloy Conductor (AAAC) the majority of the existing network is constructed to a lighter 25mm^2 Aluminium Conductor Steel Reinforced (ACSR) design. NIE Networks also has some 6.6kV overhead line but given the low volumes and the fact that it is constructed to similar specification to 11kV it is included in the RP6 submission as 11kV lines.

2.98 The 33kV network (approximately 3,150km) is less reticulated than the 11kV network in that it is generally configured as radial or ring circuits with very few spur lines. The circuits supply relatively large 33/11kV substations however there are sections that continue to supply both small villages and individual customers via smaller 33kV/LV pole mounted transformers.

2.99 As overhead lines are composed of a mixture of components with differing asset lives (including wood poles, conductors, fittings and staywires) NIE Networks do not have a like for like end of life replacement strategy for overhead lines, instead they adopt a condition based replacement approach where only the elements of a line that require replacement based on condition monitoring are addressed.

D07 and D08 - NIE Networks RP6 proposal

2.100 NIE Networks has set out its plans for investment in Distribution 33kV, 11kV and 6.6kV Wood Pole Overhead Lines in Section 6.2 of its RP6 Network Investment Plan beginning at paragraph 772. These plans are summarised in Table 2.12

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
D07 33kV wood pole overhead lines				
Re-engineer	km	455	18.277	8,316.035
Refurbish	km	910	1.630	1,483.300
Remedial	LS			82.221
Sub-total				**9,881.556**
D08 11kV and 6.6kV wood pole overhead lines				
Re-engineer	km	3,033	8.900	26,996.667
Refurbish	km	6,067	1.892	11,478.133
Remedial	LS			2,663.120
Undergrounding	LS			605.932
Sub-total				**41,743.852**

Table 2.12 – NIE Networks proposed investment in Distribution 33kV and 11/6.6kV Wood Pole Overhead Lines

2.101 NIE Networks state that "Unless network performance is to be allowed to deteriorate, there is a requirement to continue with asset refurbishment of overhead lines at least at a pace that offsets deterioration.[10]"

2.102 Accordingly, the objectives of NIE Networks' asset management strategy for distribution HV overhead lines are stated as:

i) To ensure compliance with safety legislation;

ii) To invest at a pace that offsets network deterioration;

iii) To maintain, at a minimum cost, an acceptable level of network performance during day-to-day operations; and

iv) To ensure that the network is resilient under storm conditions.

2.103 NIE Networks make the point that given the predominance of light-duty 25mm2 conductor on the network, the reference to storm resilience refers to storms that would be normally experienced during a typical weather-related event and this work programme does not establish enhanced resilience for extreme events such as widespread ice accretion.

2.104 With respect to compliance with safety legislation, NIE Networks state[11] that "Compliance with legislation as part of refurbishment has always included work required to be compliant with legislation but, in parallel, now includes the additional work required to progressively work towards compliance with ESQCR legislation. The justification for this element of the work is dealt with [separately under D43]. Hence the first objective of the refurbishment and re-engineering programmes is to aim to leave all circuits worked on safe to the public and staff and, with the addition of a separate ESQCR allowance, progressively complying with all current legislation."

2.105 The proposed overhead line work programmes are a continuation of the RP5 programmes.

2.106 NIE Networks has four categories of work associated with the Overhead Lines

i) **Refurbishment** – 15 year cycle

ii) **Re-Engineering** – Major refurbishment including reconductoring (effectively a 45 year cycle). We note that this is not full reconductoring. Note that re-engineering is not a full rebuild and does not include full pole replacement or conductor replacement.

iii) **Remedial** – 3 year cycle - replacing equipment on the network which has been identified as poor condition outside of the 15 year refurbishment cycle

[10] NIP X13.3
[11] § 786

following helicopter patrols. This has previously been known as Targeted Asset Replacement (TAR).

iv) **Undergrounding** – NEIN state that this typically related to the undergrounding of existing overhead lines into substations where population growth has occurred. Costs and volumes in RP6 are based on projected RP5 outturn.

2.107 The 33kV OHL proposed costs are derived as follows:

i) 33kV re-engineering – RP5 outturn cost;

ii) 33kV refurbishment – RP5 outturn cost plus £125/km for additional climbing inspections to identify pole top rot prior to refurbishing; and

iii) 33kV remedial – RP5 TAR outturn (adjusted for 6.5 years instead of 5.5 years)

2.108 The 33kV OHL proposed volumes are derived as follows:

i) The volumes for RP6 are based on a 15 year cycle with two thirds of the lines being re-furbished and one third being re-engineered as the re-engineering cycle is stated as being required at 45 years.

ii) On an asset base of 3,150 km, this results in 455km requiring re-engineering and 910km requiring refurbishment in the RP6 period.

iii) There are no volumes provided for remedial works, however it is stated that these works will cover the assets that are not subject to re-engineering or refurbishment in the period and be based on 3-yearly condition assessments.

2.109 The 11kV OHL proposed costs are derived as follows:

i) 11kV re-engineering – based on 2015/16 outturn cost as the mix of 25% rebuild was in line with the expected forward requirement.

ii) 11kV refurbishment - RP5 outturn cost plus £250/km for additional climbing inspections to identify pole top rot prior to refurbishing (this was later reduced to £181/km for climbing patrols as the forecast outturn cost of RP5 has increased since the original submission and the proposed RP6 cost has stayed the same.

iii) 11kV remedial works – RP5 TAR outturn (adjusted for extra year) less £1,400,000 of Connection Driven System Work that had been allocated to TAR in RP5 but will be allocated to D604 in RP6 (ref URQ093).

iv) 11kV Undergrounding – (£611,330) – RP5 outturn adjusted for additional year in RP6.

2.110 The 11kV OHL proposed volumes are derived as follows:

i) The volumes for RP6 are based on a 15 year cycle with two thirds of the lines being re-furbished and one third being re-engineered as the re-engineering cycle is stated as being required at 45 years.

ii) On an asset base of 21,000km this gives 3,033km requiring re-engineering and 6,067km requiring refurbishment in the 6.5 year RP6 period.

iii) There are no volumes provided for remedial works, however it is stated that these works will cover the assets that are not subject to re-engineering or refurbishment in the period and are based on 3 yearly condition assessments.

iv) There are no volumes presented for undergrounding.

D07 and D08 – Draft determination

2.111 We have reviewed the derivation of the volumes of re-engineering and refurbishment at 33kV and 11kV and concur that the proposed volumes meet the stated cyclic periods, that the periods are a continuation of the RP5 programmes and are appropriate to manage the overhead wood pole assets.

2.112 We have reviewed the proposed 33kV OHL costs and find as follows:

i) 33kV re-engineering – The use of RP5 outturn cost is appropriate – we accept the NIE Networks proposed unit cost;

ii) 33kV refurbishment – NIE Networks have added £125/km to the RP5 outturn unit cost to cover the costs of additional climbing inspections to identify pole top rot prior to refurbishing. Additional inspections may be beneficial but, in our opinion, they should be self-funded through efficiency savings gained during the refurbishment process and the reduction of remedial and/or fault costs. NIE Networks have not demonstrated where the reduction in overall costs due to this increased inspection will be realised for customers.

iii) 33kV remedial (£11,445) – The remedial works cost submission is based on forecast outturn to the end of RP5. The forecast out turn is based on actual outturn of the four years to 2016 and a forecast from April 2016 to September 2017. The annual costs in the forecast period for RP5 are significantly higher than the actual average annual costs in the first four years of RP5. Therefore we propose a total allowance based on prorating the actual expenditure to 2016. This gives £11,445 rather than the requested £82,221.

2.113 We have reviewed the proposed 11kV OHL costs and find as follows:

i) 11kV re-engineering – 11kV re-engineering unit costs increase by 6.7% over the RP5 outturn average. This is stated as being due to the 2015/16 outturn figures being used rather than the outturn costs over the whole period of RP5.

NIE Networks state that this was predominantly due to the fact that the percentage of reconductoring (25%) in 2015/16 was seen as more representative of the re-engineering programme going forward into RP6 and that lines that were known to not require such works were addressed earlier in the RP5 period due to uncertainties arising from the Competition Commission process. This further indicates that there is a natural variation in the types of work and that NIE Networks have control of this to some extent. We are content with the assertion put forward by NIE Networks that the 2016 cost of £8,900 is appropriate. The unit cost compares favourably with the benchmark data supplied by NIE Networks of £13,527 which we have reviewed and consider to be reasonable. As with 33kV re-engineering, the scope of NIE Networks 11kV re-engineering is not easily quantified; hence we intend to review the reporting requirements for these projects in the latter stages of RP5.

ii) 11kV refurbishment - the unit costs for this activity have increased by 10.6% over RP5. NIE Networks state that this is due to an additional £181/km for climbing patrols to check for pole top rot. As with the 33kV refurbishment we do not consider this a justifiable additional cost as NIE Networks have not demonstrated where the cost savings of this additional investment will be seen by customers. We therefore propose a unit cost based on RP5 forecast outturn.

iii) 11kV remedial works – We accept the NIE Networks' proposal to use the RP5 TAR outturn adjusted for the additional year in RP6. This is £1,400,000 less than the reported outturn cost in the cost and volumes templates as this is Connection Driven System Work that had been allocated to TAR in RP5 but will be allocated to D604 in RP6 (ref URQ093).

iv) 11kV Undergrounding – We consider that the NIE Networks proposed cost based on RP5 outturn is appropriate. We investigated whether this expenditure would be covered by the ESQCR clearance projects but having discussed with NIE Networks we are content that these are used for incremental encroachment and are sufficiently different to allow separate classification of costs.

D07 and D08 Final Determination

2.114 After reviewing NIE Networks response to our draft determination, the 5 year outturn data and after further discussions with NIE we subsequently increased the allowances for 2 sub-programmes.

2.115 In its response to our draft determination NIE Networks consider that we have made an error in not taking into account of the nature and scope of the works in relation to:

- 33kV overhead line refurbishment; and
- 11kV overhead line refurbishment

2.116 The scope change relates to undertaking additional pole top inspection to check for rot.

2.117 NIE have provided additional clarification on the safety drivers for the scope changes and explained that the works will focus on poles supporting plant items e.g. switches. We accept the need for the works.

2.118 The out turn cost available at the time of submitting and assessing the RP6 business plan did not include the additional inspections or the associated replaced poles and earthing systems driven by the inspections.

2.119 The later years of the 5 year out turn data includes for these inspections and subsequent corrective actions. We have reviewed these out turn costs and they support the unit costs proposed by NIE. We therefore accept NIE's proposed costs for 33kV and 11kV overhead line refurbishment including pole top inspections and associated replacements.

2.120 There has been no change from the draft determination in any other aspect of D07 and D08

2.121 NIE Networks RP6 proposal and our draft & final determinations of direct allowance in RP6 for distribution towers are shown in Table 2.13 (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D07 33kV wood pole overhead lines				
D07a	Re-engineer	8,316.035	8,316.035	8,316.035
D07b	Refurbish	1,483.300	1,369.550	1,483.300
D07c	Remedial Works	82.221	11.493	11.493
D07 Sub-total		**9,881.556**	**9,697.078**	**9,810.828**
D08 11kV and 6.6kV wood pole overhead lines				
D08a	Re-engineer	26,993.700	26,875.413	26,993.700
D08b	Refurbish	11,478.764	10,380.673	11,478.764
D08c	Remedial Works	2,663.120	2,663.120	2,663.120
D08d	Undergrounding	605.932	605.932	605.932
D08 Sub-total		**41,741.516**	**40,525.138**	**41,741.516**

Table 2.13 – Direct investment in Distribution 33kV and 11/6.6kV Wood Pole Overhead Lines

D09 – LV Overhead Lines

D09 - Scope of work

2.122 The low voltage distribution network in Northern Ireland comprises overhead lines supported on wood poles and underground cables. There is also a part of the network that is clipped to the eaves of properties and this is covered by a separate allowance (D10).

2.123 NIE Networks have not carried out refurbishment works on the low voltage overhead system on a cyclic basis; this has led to the system falling into a poor state of repair.

2.124 During RP5 NIE Networks executed an overhead line refurbishment programme which targeted replacement of those assets with less than estimated 3 years of remaining service life. These works covered the replacement of components such as wood poles, stay wires and insulators.

2.125 The other elements of the LV overhead line strategy are:

i) Line undergrounding (direct access): the LV overhead line is situated in between two streets of houses with back-to-back boundaries. Vehicular access may be possible although generally via a postman's walk

ii) Line undergrounding (land locked): the LV overhead line is situated in between two streets of houses with back-to-back gardens with no vehicular access possible

2.126 Due to the difficulty in accessing these parts of the network with cranes and machinery, the assets in both direct access and land locked locations tend to be in a very poor state of repair. NIE Networks' solution is to underground these sections of the network.

D09 - NIE Networks RP6 proposal

2.127 NIE Networks has set out its plans for investment in LV Overhead Lines in Section 6.2 of its RP6 Network Investment Plan beginning at paragraph 799. These plans are summarised in Table 2.14 below.

Sub-programme	Description	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
D09a	Refurbishment – Urban & Rural	Lump Sum			10,292.488
D09c	Line Undergrounding (Direct Access)	km	5	80.500	402.500
D09d	Line Undergrounding (Land-Locked)	km	13	164.138	2,133.794
D09e	Remedial	Lump Sum			790.611
					13,619.393

Table 2.14 – NIE Networks proposed investment in LV Overhead Lines

D09 – Draft determination

2.128 NIE Networks have proposed to execute the low voltage overhead line refurbishment programme in parallel with the ESQCR compliance programme (D43). We agree with this philosophy as we believe this will provide the greatest efficiency savings with respect to outage management and coordination of resources. We have, therefore, covered the refurbishment programme of works within chapter 3.

2.129 For Line Undergrounding (Direct Access) we accepted the proposed volumes as they are similar to RP5 run-rates. We also accepted the proposed unit cost as we found it to be lower than the RP5 outturn cost and the Industry Median unit cost as determined by Ofgem for the GB DNOs.

2.130 For Line Undergrounding (Land-Locked) we found the proposed unit costs to be high when compared with NIE Networks forecast outturn unit cost. We gave no weight to actual outturn costs reported in the Network Investment RIGs as NIE Networks have reported only 1km completed.

2.131 In a supplementary document submitted by NIE Networks 22 February 2017 they state that the unit cost for land-locked works has increased to £242.81k/km based on completion of projects since March 2016. At the time of writing we have received little documentary evidence of increased costs; hence we have taken no action to increase this allowance.

2.132 We accepted NIE Networks proposed costs for remedial works as we found these to be lower than the outturn costs incurred in RP5

D09- Final Determination

2.133 After reviewing NIE Networks response to our draft determination and the 5 year outturn data we maintained the volumes as stated in our draft determination and subsequently increased the allowances for one sub-programme.

2.134 In its response to our draft determination NIE Networks stated that we "*failed to have regard to the latest available RP5 outturn data*" with respect to sub-programme D09d. We deal with the issues identified as "errors" by NIE Networks in turn.

2.135 NIE Networks state[12] that we were in error to dismiss the revised evidence provided in February 2017.

i) The evidence referred to is a statement[13] that unit costs for undergrounding (land-locked poles) have risen from £164k to £242k. We did not view this statement as evidence and as such did not act upon it.

ii) We received an email dated 3 March 2017 containing data relating to units completed and the associated costs, we did not act on this information due to lack of detail.

iii) NIE Networks submitted a document entitled "Post DD Response" dated 26 May 2017. In this document NIE Networks provided actual project details which supported their claim of increased unit costs.

2.136 We are therefore content to increase the allowance from £2.852m to £4.350m taking cognisance of the increased unit cost of undergrounding (land-locked) of £245.8k.

[12] Response to the Utility Regulator's Draft Determination, Annex 3.1, paragraph 3.7

[13] "NIE Networks Response to Post Engagement and Queries – Part 2" dated 22 February 2017, paragraph 2.2.2

2.137 NIE Networks RP6 proposal and our draft & final determinations of direct allowance in RP6 for LV overhead lines are shown in Table 2.15 (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D09a	LV OHL Refurbishment	-	-	-
D09c	Undergrounding (direct access)	402.500	402.500	402.500
D09d	Undergrounding (land-locked)	2,133.794	1,631.708	3,156.530
D09e	Remedial Works	790.611	790.611	790.611
D09 Total		**3,326.905**	**2,824.819**	**4,349.641**

Table 2.15 – Direct investment in LV Overhead Lines

D10 – Undereaves

D10 - Scope of work

2.138 Undereaves mains consist of a bundle of four insulated cables (3 phases and neutral) attached to the brickwork, facia or soffit of the property being supplied. Single or three phase services are connected to the mains and are clipped directly to the walls of the property being supplied. This form of supply was installed between 1950's and 1970s and was considered to be a low cost alternative to underground cabling.

2.139 A number of insulation types have been utilised on undereaves mains and services. The oldest cables still in commission were insulated with PolyButylJute (PBJ), this type of insulation deteriorates over time. First the jute outer serving rots and falls away from the cable then the polybutyl rubber insulation becomes brittle and forms cracks which expose the live core of the cable. The undereaves wiring is readily accessible to members of the public cleaning windows or carrying out maintenance to eaves woodwork, hence exposed live conductors represent a danger.

2.140 NIE Networks discontinued the use of PBJ insulation in the early 1970's and, instead, utilised a cable with a single layer of PolyVinylChloride (PVC) insulation referred to as "single insulated". PVC is much more stable than PBJ insulation but is still prone to cracking over time due to exposure to ultra-violet light.

2.141 Wiring regulations were updated in the late 1970's and the requirement to have mechanical protection over primary insulation came into being. NIE Networks began to use PVC insulated and PVC sheathed cables referred to as "double insulated". These cables provide better mechanical protection and are less prone to exposure of live conductors.

2.142 NIE Networks now use Aerial Bundled Conductor (ABC), a preformed bundle of four single core cables insulated with PVC or Cross Linked PolyEthylene (XLPE). The thickness and grade of insulation provide insulation and protection in one layer and the material is pre-treated to prevent degradation through exposure to ultra-violet light.

D10 - NIE Networks RP6 proposal

2.143 NIE Networks has set out its plans for investment in Undereaves Cables in Section 6.2 of its RP6 Network Investment Plan beginning at paragraph 811. These plans are summarised in Table 2.16

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Replace services (undereaves)	Each	19,500	0.513	**10,003.500**

Table 2.16 – NIE Networks proposed investment in Undereaves Cables

D10 – Draft determination

2.144 NIE Networks have stated that at the beginning of RP6, there will be approximately 10,000 PBJ insulated services still in commission. This number will be confirmed as ESQCR patrolling is concluded. NIE Networks have further stated that more than 24,000 properties are serviced by PVC insulated undereaves wiring and that the oldest stock is now ready for replacement.

2.145 As part of the query process we asked NIE Networks to verify the volumes in their undereaves replacement programme for RP6 as the annual volume of properties was not immediately clear. NIE Networks confirmed in their response to query URQ018 that their intention is to complete 3,000 properties per year which represents a price control total of 19,500 properties.

2.146 NIE Networks stated in their response to query URQ019 that they intend to begin replacement of PVC insulated mains and services during RP6 upon completion of PBJ replacement. Therefore, the funding request encompasses 10,000 PBJ insulated properties and 9,500 PVC insulated properties.

2.147 At an engagement meeting held 6 October 2016, NIE Networks informed us that they have not yet ascertained the actual volume of PVC replacements required in RP6 and the volume of 9,500 was used as a proxy to maintain the RP5 run-rate of 3,000 properties.

2.148 We found the proposed unit cost to be high when compared to the first four years of RP5 outturn costs. At a pre-draft determination engagement NIE Networks explained that the unit rate will increase during the later stages of RP5 due to sparsity of works caused by the advanced nature of the undereaves replacement programme. We were not convinced by this argument given the proposed continued run-rate of 3000 properties during RP6.

2.149 Owing to the uncertainty around the numbers of services to be replaced in RP6 we have decided to allow an ex-ante amount for the replacement of 10,000 PBJ insulated properties and a capped volume driven allowance for the replacement of up to 9,500 properties. The volume driven element will provide NIE Networks with the

flexibility to replace all of the services required and provides greater protection to the customer than the cost risk sharing mechanism alone.

D10 – Final determination

2.150 The RP6 draft determination included an allowance for the on-going replacement of under-eaves wiring. NIE Networks considers the investment is necessary to remove the hazards associated with end-of-life and to ensure that the company remains compliant with safety legislation. NIE Networks business plan submission proposed a unit cost of £513 for this work.

2.151 The Utility Regulator's draft determination proposed a lower unit cost of £408 based on the out-turn unit cost for the first four years of RP5. In the final determination, we have amended that rate to allow for the rate for the first 5 years of RP5. In principle, we consider it reasonable for a regulator to assume that rates revealed in one price control should be the basis for the determined rates in a subsequent price controls unless there is compelling reasons to believe that the rate is not efficient or that there are material changes in RP6 outwith the control of the company.

2.152 In its response to the draft determination, NIE Networks identified the following errors in the Utility Regulator's draft determination:

i) That the Utility Regulator had failed to appreciate that the scope and nature of the work to be undertaken in RP6 differs from that undertaken in RP4 and RP5. The company's response states that the "nature of work to be undertaken in RP6 differs from that in RP4 and RP5 and comprises of 1,538 PBJ properties per annum (a significant ramping down of like-for-like property types, representing approximately half of the RP5 run rate) with the remainder being a new category of single PVC insulated wired properties (being approximately half of the RP6 work programme)."[14]

ii) That "it would be that it would be an error for the UR to disregard the change of scope and nature of the works from higher density housing to lower density housing and the associated unit cost impact"[15.]

2.153 NIE Networks subsequently clarified "that the scope of work to be carried out on undereaves refurbishment during RP6 involves the replacement of both undereaves mains and services and that there has therefore been no specification change from that delivered during RP5"[16.] This clarification addressed a statement in RP6 Annex NIPX13.5 which suggested that there was a change of specification.

2.154 The company's response focus on the impact which a change in cluster size might have on the unit cost of delivery. To support this conclusion, the company offered two pieces of evidence:

[14] Response to the Utility Regulator's Draft Determination, Annex 3.1, paragraph 2.6
[15] Response to the Utility Regulator's Draft Determination, Annex 3.1, paragraph 2.8
[16] *NIE Networks Clarifications post DD Response Meeting with the UR, 26/05/2017*

i) Information on the average size of cluster for undereaves schemes in the first five years of RP5.

ii) Information on the average unit cost of delivery in the first five years of RP5.

2.155 This information is reproduced in Figure 1 below which superimposes the movement in cluster size and annual unit rate for RP5.:

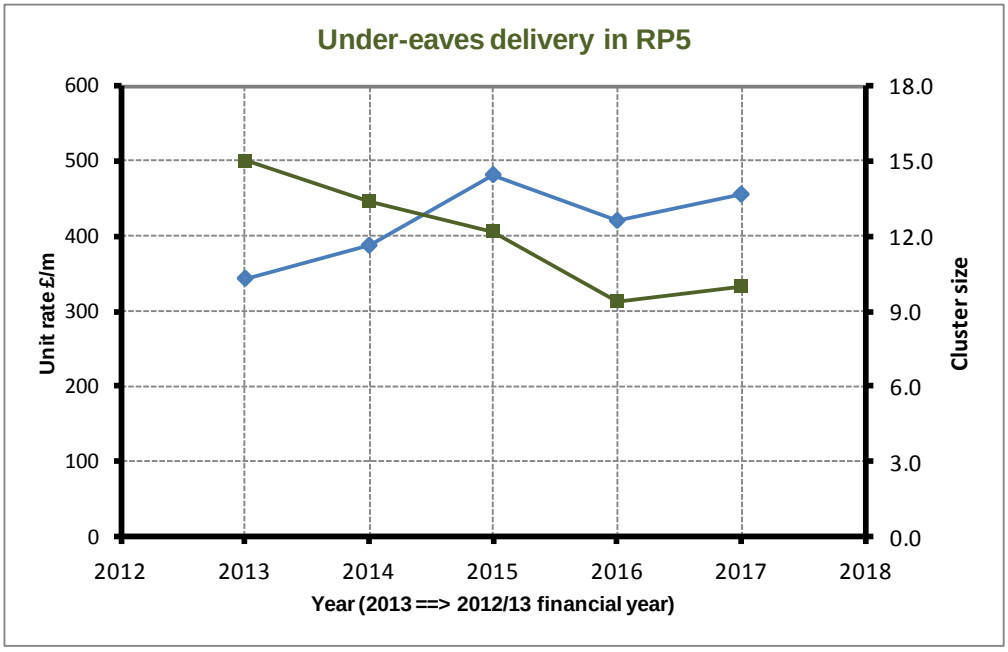

Figure 2.1: Undereaves delivery in RP5

2.156 The basic premise of the company's argument is that there is a strong inverse correlation between the size of cluster and the unit cost of delivery and the cluster size will continue to fall in RP6. In respect of this argument, we note that:

i) In 2 years of RP5, the unit rate increased as cluster size reduced, in the other two years, unit rates moved in the same direction as cluster size. The evidence for an inverse correlation is weak.

ii) We note that the analytical element of the company argument is based on 5 data points which limits any conclusions which can be drawn. Based on simple statistical analysis, most data can be shown to fall within 10 percentile and 90 percentile of the respective means. The limited data could reasonably be explained by random variability rather than a trend.

iii) Establishing a linear regression between cluster size and average unit rate shows an inverse relationship with an R^2= 0.43. However, this is entirely dependent on the 2013 data point. Removing the 2013 data point reduces the strength of the relationship and reduces the R^2= 0.06. In view of the small data sample, we place limited weight on the statistical relationship the company claims between cluster size and unit rate.

iv) The company has offered no justification for the trends it has imposed on the plots of cluster size and unit rates other than the use of a logarithmic curve

and an expectation that cluster sizes will reduce and unit rates will increase. The company has offered no substantive evidence on future cluster sizes or the cost of carrying out the work.

2.157 We consider it good regulatory practice to assume that the cost future work can estimated from the costs revealed during a price control unless there is real and substantive evidence to support an increase. In this case, we consider the company's evidence as an attempt to mine limited and inadequate data to propose an increase in unit rates in RP6.

2.158 We note that for RP5, CC determined a rate of £603 per unit, but the company was able to deliver at a rate of £423 per unit. It is not clear that the saving is efficiency or whether it was a case of over estimation in the first place.

2.159 While we have concluded that the rate revealed in RP5 is a reasonable basis for determining costs in RP6, we consider it appropriate to explore our approach in these circumstances had we concluded that unit rates would increase in RP6.

2.160 The company explained the reason unit rates had increased across RP5 and are expected to continue to increase into RP6 because of a conscious effort to target lower unit cost properties first: "It has been NIE Networks' approach to prioritise the larger cluster sites during RP5 leaving smaller ones and single dwellings until RP6 is the most efficient way of reducing the risk associated with undereaves wiring."[17]

2.161 The company's position is that it was right to select the lowest cost items for delivery in RP6, that it had the ability to do so (through selection on cluster size) and that it consciously set out to do so. It argued that this choice that it is "the most efficient way of reducing the risk associated with undereaves wiring". The company has offered no evidence that there is a difference in risk in individual cases which correlates to the cost of remediation. The reduction in risk in RP5 is linked to the number of units delivered, not the cost per unit. Given, that the company has delivered only the number of units required by the determined output for RP5, the conscious selection of low cost units has not affected the risk profile. The company's argument would have merit if its target was to deliver as much as it could for a fixed sum. In these circumstances, delivering low cost units would maximise the output and maximise risk reduction. However, this is not the case in RP5. By consciously selecting the cheapest units in RP5, the company has deferred delivery of the higher unit coat items to RP6. In the absence of any adjustment for pre-funded costs under the D3 mechanism, only the company benefits from this approach.

2.162 If selection in RP5 did require a higher unit rate for work in RP6, we would therefore have to consider the impact of deferral of the higher cost units and estimate the pre-funded cost associated with this. While we have not accepted the increased unit rate proposed by the company, we have tested this option on the assumption that the rate for the remaining work in RP6 would increase to £513 as suggested by the company. We made this assessment as follows:

[17] Response to the Utility Regulator's Draft Determination, Annex 3.1, paragraph 2.10

i) We made the assumption that the company had justified the increased rate for delivery in RP6 and that the proposed rate would be the out-turn rate.

ii) We assessed the average unit rate for delivery over two price controls RP5 and RP6.

iii) We assumed that without consciously selecting the lowest cost units in RP5, the company would have delivered at the combined average unit rate in RP5 and RP6.

iv) We calculated the pre-funded element of RP6 as the number of units delivered in RP5 multiplied by the difference in the combined average rate over RP5 and RP6 and the actual unit rate revealed in RP5.

v) We assumed that the determined rate for RP6 would be the combined average over RP5 and RP6 and the company would deliver at the company's estimated rate for RP6.

2.163 The outcome of this equitable approach to the treatment of deferral and pre-funded costs in light of conscious cost selection was that the company position at the end of RP6 was similar to its position if we applied the RP5 revealed rate as the determined rate for RP6.

2.164 On the basis of this test, we have concluded that the difference in determining RP56 on the revealed unit rate from RP6 and accepting the company's argument for a higher rate would be marginal. While we have rejected the company's submission in light of the weaknesses of the evidence, we also note that, taking account of the impact of deferral of high cost units to RP6, the decision is not material to the company position over RP5 and RP6.

2.165 NIE Networks RP6 proposal and our draft & final determinations of direct allowance in RP6 for undereaves replacement are shown in Table 2.17 (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD allowance (£k)	FD allowance (£k)
D10a	Replace undereaves mains and services	**10,003.500**	**7,952.100**	**8,169.330**

Table 2.17 – Direct investment in Undereaves Cables

Cable Asset Replacement and Refurbishment

D16 – Distribution Cables

D16 - Scope of work

2.166 NIE Networks have an extensive underground cable network which is predominantly situated in urban areas where, for safety or aesthetic reasons, it is difficult to build overhead lines.

2.167 Underground cable cores are made from either copper or aluminium. Although aluminium is less expensive it is also less efficient as a conductor of electricity, hence aluminium cables tend to be physically larger than those using copper.

2.168 There are many different types of cable in use on NIE Networks' system. The various types of cable reflect the different standards and manufacturing techniques available at the time of purchase hence the oldest cables utilise Vulcanised Bitumen (VB) or oil impregnated paper as an insulation medium whilst the newest cables will use Cross Linked Polyethylene (XLPE) or Poly Vinyl Chloride (PVC).

2.169 Fluid filled cables were installed on the 33kV system between 1940's and 1970's. These cables are paper insulated but have ducts built into the cable which allow oil to circulate and cool the cable core. This allows greater current carrying capacity at a reduced initial outlay due to smaller core sizes. The trade-offs are :

i) greater environmental risk in the event of a cable or joint failure due to oil spillage;

ii) cable joints are more difficult (hence more costly) to install;

iii) general maintenance is more costly owing to the greater number of above ground components; and

iv) this type of cable is generally installed in city centres or under main arterial roads and is, therefore, difficult to replace.

2.170 CONSAC is a type of LV cable that was utilised by almost all UK DNOs during the late 1970's and early 1980's. Due to the design of the cable it performed very poorly and is the cause of numerous faults. The cable is now considered not fit for purpose and is being systematically replaced by all DNO's who installed it.

D16 - NIE Networks RP6 proposal

2.171 NIE Networks has set out its plans for investment in Distribution Cables in Section 6.3 of its RP6 Network Investment Plan beginning at paragraph 826. These plans are summarised in Table 2.18 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Replacement of HV cable	M	18,000	0.970	1,746.000
Replacement of LV cable	M	30,000	0.128	3,840.000
33kV FFC Refurbishment	Each	11	31.453	345.983
33kV PILC Cable part replacement	M	5,340	0.159	849.060
Leak Management Technologies	Lump Sum			137.873
Distribution cable accessories and ancillaries	Lump Sum			541.132
Condition monitoring	Lump Sum			210.000
				7,670.048

Table 2.18 – NIE Networks proposed investment in Distribution Cables

D16 – Draft determination

2.172 Replacement of HV cables is an ongoing task due to the age and condition of the existing assets. We accept the volumes proposed by NIE Networks as they are similar to the RP5 run-rates. We also accept the unit costs as they are lower than the RP5 outturn costs.

2.173 Replacement of LV cables is also an ongoing task due, mainly, to the need to replace CONSAC cable. NIE Networks are proposing to replace LV cables at a higher run-rate to that of RP5, totalling 30,000m for the RP6 period. This equates to an average annual output of around 4,600m per annum.

2.174 For RP5 NIE Networks were funded to replace 20,500m of LV cable (includes 6000m of VB cable) which equates to 3,727m per annum. As of March 2016 NIE Networks reported a total output of 5,992m which is equivalent to approximately 1,500m per annum. Although NIE Networks are forecasting to complete all outputs in this category during RP5 it seems unlikely that they will install 14,500m in the last 18 months of RP5. Furthermore, we found no justification in the business case to increase output by more than 30%.

2.175 Whilst we accept the unit cost for this sub-programme, we do not accept the volume and propose to allow funding for 24,227m which is the equivalent to the RP5 allowed run-rate mentioned in 2.174 above.

2.176 The refurbishment of fluid filled cables is an ongoing sub-programme. NIE Networks are proposing to carry out a higher volume of works during RP6 at a greatly reduced unit cost. Upon reviewing the RP5 business plan we found that the RP6 scope of work is reduced to refurbishing cable joints only. We accept both the volumes and costs proposed.

2.177 Replacement of 33kV Paper Insulated Lead Covered (PILC) cable is a new sub-programme; hence we have no historical data on which to make a comparison. We accept the volumes as NIE Networks provided a strong technical justification for the

proposed cable replacement; we also accept the unit cost as it is lower than the industry median unit cost calculated by Ofgem for the GB DNOs.

2.178 We accept the proposed lump sum for leak management technologies. The proposed expenditure is lower than that of RP5 but provides clear benefits in the detection of leaks on fluid filled cables

2.179 We accept the proposed lump sum for cable accessories and ancillaries. NIE Networks provide a strong justification in their business plan for the need for this expenditure.

2.180 We accept the proposed lump sum for purchase of on-line condition monitoring equipment. NIE Networks provide a strong justification in their business plan for the need for this expenditure.

D16 – Final determination

2.181 NIE Networks made no comments on our draft determination and we have made no further revisions

2.182 NIE Networks RP6 proposal and our draft & final determinations of direct investment in RP6 for distribution cables are shown in Table 2.19 (see Annex P for details of units of measure, volume and unit cost)

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Cost (£k)	FD Cost (£k)
D16i	Replacement of HV cable	1,746.000	1,746.000	1,746.000
D16j	Replacement of LV cable	3,840.000	3,101.056	3,101.056
D16l	33kV FFC Refurbishment	345.983	345.983	345.983
D16m	33kV PILC Cable part replacement	849.060	849.060	849.060
D16n	Leak Management Technologies	137.873	137.873	137.873
D16o	Distribution cable accessories and ancillaries	541.132	541.132	541.132
D16p	Condition monitoring	210.000	210.000	210.000
D16 Total		**7,670.048**	**6,931.104**	**6,931.104**

Table 2.19 – Direct investment in Distribution Cables

D603 Distribution Protection

D603 - Scope of work

2.183 The proposed investment covers three main equipment categories:

i) Electrical Protection systems

ii) Substation monitors

iii) Reverse Power monitoring

2.184 Protection systems and monitoring equipment inherently have a shorter asset life than their associated switchgear and plant and therefore in addition to end of life replacement for switchgear and plant there is a requirement to replace protection systems during the life of the associated switchgear and plant.

D603 - NIE Networks RP6 proposal

2.185 Electrical Protection Systems

i) NIE Networks has stated that previous switchgear replacement carried out during RP5 also included for replacement of the associated protection systems. However, there remains a significant quantity of switchgear on the system in satisfactory condition but with associated protection systems that are more than 25 years of age.

ii) The protection systems are considered to be at end of life condition, and NIE Networks state they are no longer supported by the original equipment manufacturer and suffer from condition related problems.

iii) Given the critical nature of protection systems for successful network operation, NIE Networks consider that replacement of the systems at an end of life condition is required to ensure appropriate plant and equipment isolation under fault conditions, and that there is no deterioration of current service levels to customers.

2.186 Substation Monitors

i) The existing substation monitors were installed in the late 1980's and early 1990's. Their primary function was to act as a Fault Recorder for post-fault data investigation and analysis. NIE Networks state that the monitors are now obsolete and in poor condition, with several no longer able to function correctly.

ii) Furthermore, industrial and business customers now require a wide range of information that cannot be obtained from the existing monitors, mainly related to power quality monitoring.

iii) NIE Networks consider that the investment is required to replace the obsolete and mal-functioning monitors and increase the data available for post-fault investigation and Quality of Supply issues.

2.187 Reverse power monitoring

i) The increased penetration of distributed generation, typically connected to the distribution system, means that load can be supplied via generation on the distribution system and, under certain conditions, reverse the flow of power on the system. The original network design principles were based on generation connected to the transmission system without reverse power flow.

ii) Given these new operating conditions, NIE Networks consider there is a requirement to obtain reverse power flow information to assist with real time operation of the network and to inform planning and investment decisions.

2.188 NIE Networks has set out its plans for investment in Distribution Protection in Section 6.4 of its RP6 Network Investment Plan beginning at paragraph 955. These plans are summarised in Table 2.20

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
33kV Protection Systems	Lump Sum			339.100
11kV Protection Systems	Lump Sum			793.750
Substation Monitors	Lump Sum			1,226.300
Reverse Power Flow	Lump Sum			1,500.000
				3,859.150

Table 2.20 – NIE Networks proposed investment in Distribution Protection

D603 – Draft determination

2.189 We have reviewed the information provided by NIE Networks in the RP6 Investment plan and subsequent responses to our questions.

2.190 We are satisfied that there is a need for the D603 work programme.

2.191 The volume of the potential work programme during RP6 is clearly defined and the requested volumes are appropriate.

2.192 We have reviewed the unit costs and consider that they are in line with industry norms; however, we have disallowed capital expenditure on Strategic Spare Relays as NIE Networks have not defined the specific items or volumes. Furthermore, the replacement programme extends throughout the RP6 period so any risk should be able to be mitigated.

D603 – Final determination

2.193 NIE Networks made no comments on our draft determination and we have made no further revisions

2.194 NIE Networks RP6 proposal and our draft & final determinations of direct investment in RP6 for distribution cables are shown in Table 2.21 (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D603	Distribution Protection	**3,859.150**	**3,762.145**	**3,762.145**

Table 2.21 – Direct investment in Distribution Protection

Other non- load related expenditure

D39 and D41 – Network IT and Telecommunications

D39 and D41 - Scope of work

2.195 Network IT and Telecoms equipment enables NIE Networks to control the Distribution network through the SCADA (Supervisory Control and Data Acquisition) system and Operational Telecoms Network. This investment category includes:

i) Replacement of RTUs (Remote Terminal Units), Marshalling Kiosks and Receivers

ii) Control Centre hardware and software (SCADA) upgrade

iii) Communications for switching and monitoring replacement including BT 21st Century (BT21CN) replacement.

D39 and D41 - NIE Networks RP6 proposal

2.196 NIE Networks has set out its plans for investment in Network IT and Telecommunications in Section 6.5 of its RP6 Network Investment Plan beginning at paragraph 1001. These plans are summarised in Table 2.22

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
D39 - SCADA	Lump Sum			5187.000
D41 – Operational Telecoms Network	Lump Sum			3,302.000
D41 - BT21CN	Lump Sum			1,654.000
				10,143.000

Table 2.22 – NIE Networks proposed investment in Network IT and Telecommunications

2.197 Replacement of RTUs, Marshalling Kiosks and Receivers

i) The replacement of the RTUs has been delayed from RP5 based on advice from the manufacturer that the 15 year product life could be extended a further 5 years with some hardware upgrades. During the RP6 period the majority of RTUs will reach their 20 year service life. NIE Networks are proposing to replace 50% of the existing RTUs with modern units.

ii) NIE Networks' unit cost for replacing 122 RTUs is £30.2k each. NIE Networks state that they have not undertaken any replacements of their own RTU's in RP5 hence their proposed unit cost rate has been developed based on the cost of new units installed as part of customer connections. A reduction to this unit cost has however been included based on anticipated efficiencies obtainable during RP6 through competitive tendering approaches.

iii) RTU unit costs vary depending on the size of the unit and NIE Networks have based the unit cost on the most common RTU size that they are replacing.

iv) NIE Networks have proposed the replacement of the remaining 50% of the RTUs during the RP6 period to facilitate the implementation of 'smart' solutions under the 'Investing for the future' programme. We have addressed this in chapter 4 (D602).

2.198 Control Centre hardware and software (SCADA) upgrade

i) The existing ABB "Spider" SCADA control centre system was commissioned in 2008/09 and is approaching the end of its design life and will be required to be replaced during RP6.

ii) Upgrading the existing system achieves NIE Networks requirements without the consequential costs associated with moving to a completely new system. NIE Networks are planning to complete the upgrade by 2019/20

2.199 Communications for switching and monitoring replacement (including BT 21st Century replacement)

i) As indicated above, the proposed telecommunications expenditure comprises a number of programmes of work to replace/upgrade existing communications infrastructure assets. The asset replacement is driven primarily by the requirement to replace aging and obsolete assets.

ii) In the case of the major components of the Operational Telecoms Network (OTN), these are reported to be in excess of 20 years old, which is beyond the expected product life.

iii) In the replacement programme NIE Networks are implementing an IP based communication infrastructure so increasing capacity and improving the resilience of the network. This is in line with industry practice.

iv) British Telecom has informed NIE Networks that support for legacy leased low bandwidth digital (less than 2 mbps) and analogue pilot circuits will not be extended beyond 31st March 2020. Migration of the services using these circuits commenced in RP5 with completion in RP6 as planned. The cost estimate for completion of this programme is £1,654k based on the costs provided from the existing telecommunication provider.

D39 and D41 – Draft determination

2.200 We have reviewed the need for the replacements programmes identified by NIE Networks and agree that Network IT and Telecoms assets concerned require replacement.

2.201 We have reviewed the costs provided by NIE Networks and consider that they are reflective of industry current norms for the type and size of equipment to be replaced/upgraded.

D39 and D41 – Final determination

2.202 NIE Networks made no comments on our draft determination and we have made no further revisions

2.203 NIE Networks RP6 proposal and our draft & final determinations of direct investment in RP6 for network IT and telecommunications are shown in Table 2.23 (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D39a	Replace RTU	3,686.962	3,686.962	3,686.962
D39b	Control centre hardware & software	1,500.000	1,500.000	1,500.000
D39 Sub-total		**5,186.962**	**5,186.962**	**5,186.962**
D41a	Operational telecoms network	3,302.000	3,302.000	3,302.000
D41b	BT21CN	1,654.000	1,654.000	1,654.000
D41 Sub-total		**4,956.000**	**4,956.000**	**4,956.000**

Table 2.23 – Direct investment in Network IT and Telecommunications

D101 – Network Alterations

D101 - Scope of work

2.204 From time to time NIE Networks receive requests from customers to make alterations to the system for which they are unable to recover their costs (either partially or totally) due to the nature of existing wayleave agreements.

2.205 In addition the Northern Ireland Road Authority and Utility Committees (NIRAUC) have developed the Diversionary Works Code of Practice which requires all of the utility companies to make a contribution to TransportNI whenever their apparatus is to be moved due to works in the highways. At present the contribution is 18% of the costs to move the apparatus.

D101- NIE Networks RP6 proposal

2.206 NIE Networks has set out its plans for investment in Network Alterations in Section 6.5 of its RP6 Network Investment Plan beginning at paragraph 1077. These plans are summarised in Table 2.24 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Non Recoverable Alterations	Lump Sum			11,999.507
Part Recoverable Alterations	Lump Sum			3,548.085

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
NIRAUC Schemes	Lump Sum			135.662
				15,683.254

Table 2.24 – NIE Networks proposed investment in Network Alterations

D101– Draft determination

2.207 Given the reactive nature of these works we would expect historic expenditure to be a good indicator of future expenditure. When we compared NIE Networks proposed lump sums with their direct outturn expenditure for the first 4 years of RP5, we found the proposed amounts to be high.

2.208 In paragraph 1079 of the RP6 Networks Investment Plan, NIE Networks state "It should be noted that in RP5, Non recoverable alterations and Part recoverable alterations are reported together".

2.209 We found the RP5 outturn expenditure between 2012/13 – 2015/16 to be £8.41m. We extrapolated this figure over the duration of the RP6 business plan to determine an allowance.

D101– Final determination

2.210 After reviewing NIE Networks response to our draft determination and the 5 year outturn data we subsequently increased the allowance for one sub-programme.

2.211 In its response to our draft determination NIE Networks stated the "*proposed allowance is based on inappropriate data source*". We deal with the issues identified as "errors" by NIE Networks in turn.

2.212 NIE Networks stated[18] that we were in error to use RP5 outturn data as a starting point to calculate RP6 allowances due to the exclusion of PECR (Part Estimate Cost Recoverable) and NIRAUC (Northern Ireland Roads and Utilities Committee) costs.

i) Whilst we accept that NIE Networks informed us that PECR costs were incorrectly allocated to Network Access and Commissioning we understood this to mean that these costs were double counted in the network investment plan due to the statement "*It should be noted that in RP5, Non-recoverable and Part-recoverable alterations are reported together*"[19]

ii) NIE Networks has since confirmed that the above statement is incorrect and has provided up to date outturn costs for all alterations. This data supports NIE Networks original proposed allowance

2.213 We are therefore content to increase the allowance from £13.671m to £15.683m.

[18] Response to the Utility Regulator's Draft Determination, Annex 3.1, paragraphs 4.5 & 4.6
[19] NIE Networks – RP6 Networks Investment Plan 29 June 2016 paragraph 1079

2.214 NIE Networks RP6 proposal and our draft & final determinations of direct investment in RP6 for network alterations are shown in Table 2.25 (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Cost (£k)	FD Cost (£k)
D101a	Network Alterations	15,547.592	13,534.876	15,547.592
D101b	NIRAUC Schemes	135.662	135.662	135.662
D101 Total		**15,683.254**	**13,670.538**	**15,683.254**

Table 2.25 – Direct investment for Network Alterations

D604 - Connections Driven System Work

D604 - Scope of work

2.215 This investment project has been included in the RP6 submission to provide funding in relation to works associated with customer driven activity requests for new connections or alterations in existing connections where costs are not chargeable to the customer. The work is reactive in nature and arises as part of providing a new or upgraded customer connection where NIE Networks will need to replace pre-1992 assets that are not in a suitable condition to maintain the integrity of the customer connection due to reasons such as deterioration. The works completed under this category will only be replaced if required to facilitate a reliable and secure connection whilst not providing an increase in capacity. If a capacity increase in the existing assets is required as part of a customer connection then the customer would be expected to fund the replacement assets.

2.216 Further commentary on the works that are chargeable to customers are detailed in NIE Networks "Statement of Charges for Connection to the Northern Ireland Electricity Distribution System".

D604 - NIE Networks RP6 proposal

2.217 NIE Networks has set out its plans for investment in Connections Driven System Work in Section 6.5 of its RP6 Network Investment Plan beginning at paragraph 1110. These plans are summarised in Table 2.26 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Connection driven system work	Lump Sum			**7,255.215**

Table 2.26 – NIE Networks proposed investment in Connections Driven System Work

D604 – Draft determination

2.218 NIE Networks have not reported their historic costs for this work stream in the Network Investment RIGs. Although the costs were included in the Financial Data RIGs and the C1 matrices of the Cost and Volume RIGs, they were not reported as discrete line items therefore we were unable to determine outturn expenditure.

2.219 Upon request NIE Networks submitted a breakdown of their costs which included 4 years of outturn costs and 1.5 years of forecast costs.

2.220 We disregarded the forecast costs, given the reactive nature of the works, and based our determination solely on outturn costs.

2.221 We found that NIE Networks have been reporting a portion of their costs in the indirect costs section of the Cost & Volumes RIGs and, subsequently, we have included these costs in our opex benchmarking process.

2.222 We used the average annual expenditure (based on 2012/13 – 2015/16) extrapolated for the RP6 price control duration, less £69k pa, which was included in the opex benchmark, as the RP6 allowance.

D604 – Final determination

2.223 After reviewing NIE Networks response to our draft determination and the 5 year outturn data we subsequently increased the allowance for this sub-programme.

2.224 In its response to our draft determination NIE Networks stated the "*proposed allowance is based on inappropriate data source*". We deal with the issues identified as "errors" by NIE Networks in turn.

2.225 NIE Networks stated[20] that we were in error to use their submitted 2016 data in our allowance calculations and that we should have been aware that internal business process changes caused an error in its reporting.

i) It is not clear to us how we could have been aware of NIE Networks business process changes or how they affected the data submitted

2.226 NIE Networks stated[21] that we are in error to make a deduction in the direct allowance based on costs included in the opex benchmarking process.

i) We asked NIE Networks to identify where in the cost and volumes C1 matrix the costs for this strand of work were being reported. In its response[22] it was stated that an element of the costs were being reported in the indirect columns of the C1 matrix.

ii) In addition, the response indicated that the proposed allowance of £7m was based on Opex costs as well as Capex costs.

[20] Response to the Utility Regulator's Draft Determination, Annex 3.1, paragraphs 4.17 & 4.18
[21] ibid, Annex 3.1, paragraph 4.19
[22] Email from (NIE Networks) to C Walker (UR) dated 21 Feb 2017

iii) We made the deduction on the understanding NIE Networks was reporting direct costs in indirect categories and that the indirect would be double funded through indirect allowances and direct allowances.

2.227 NIE Networks is now proposing an allowance based solely on Capex costs as reported in the Financial Data RIGs

2.228 We are in receipt of revised data which supports NIE Networks revised proposal

2.229 NIE Networks RP6 proposal and our draft & final determinations of direct investment in RP6 for connections driven system work are shown in Table 2.27 (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Cost (£k)	FD Cost (£k)
D604	Connections Driven System Works	**7,255.215**	**2,988.404**	**4,320.000**

Table 2.27 – Direct allowance for Connections Driven System Work

D50 – Distribution Substations Flood Prevention

D50 - Scope of work

2.230 After the flooding incidents which occurred in England during 2007, the Energy Minister requested a comprehensive assessment of the resilience to flooding of primary and higher voltage substations and the steps taken to mitigate current and future risks. As a result of this, the Energy Networks Association (ENA) produced Engineering Technical Report (ETR) 138

2.231 ETR138 concluded that flood reinforcement works should be carried out on sites at risk of flooding.

2.232 NIE Networks propose to protect all primary substation sites at risk of flooding and a number of secondary sites that are at most risk of flooding or where the consequences of flooding at that site would be highest

D50 - NIE Networks RP6 proposal

2.233 NIE Networks has set out its plans for investment in Distribution Substations Flood Prevention in Section 6.5 of its RP6 Network Investment Plan beginning at paragraph 1119. These plans are summarised in Table 2.28 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Permanent protection several distribution substations	Each	9	122.882	1,105.939

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
RMU substations - provision of flood protection by raising the kiosk	Each	200	13.000	2,600.000
				3,705.939

Table 2.28 – NIE Networks proposed investment in Distribution Substations Flood Prevention

D50 – Draft determination

2.234 We accepted the volume for the protection of primary substation sites as there is sufficient technical justification in the business plan. We also accepted the unit costs as they are lower than both the RP5 allowance and the industry median unit cost.

2.235 We have no data with which to compare the costs of RMU flood protection; however NIE Networks did provide a detailed breakdown of their risk analysis, prioritisation of sites and expected unit costs. From the information submitted we accepted the unit costs but could not find justification for the volumes proposed.

2.236 NIE Networks identified 15 very high risk sites and 63 high risk sites. A further 487 sites were categorised as medium, low or very low risk.

2.237 During RP6 NIE Networks propose to install flood defences at the very high and high risk sites plus a further 122 medium risk sites.

2.238 We decided to allow funding for the very high and high risk sites and the substations classified as “strategic” that are in the medium risk category and are at risk from coastal or fluvial flooding.

2.239 Given the developmental stage of pluvial flood maps coupled with the fact that there is little evidence of historical flooding issues, we were not convinced that there was sufficient justification for funding to provide flood defences at 200 RMU sites.

D50 – Final determination

2.240 NIE Networks did not comment on our draft determination; however, upon review of the five year outturn cost data, we found that a reduction in allowance for one sub-programme was warranted.

2.241 Our draft determination allowed a higher rate than the RP5 outturn based on the delivery of relatively few outputs and the fact that the proposed unit cost was significantly less than the RP5 allowed unit cost.

2.242 NIE Networks forecast outturn cost for RP5 was £77.3k and we initially allowed £122.9k

2.243 Upon review of the five year outturn data we found the outturn unit cost to be £36.6k

2.244 During our meeting dated 20 June, NIE Networks stated that the outturn costs were low because, during RP5, it had installed flood defences at substations that were being refurbished and that the costs were hidden in civil works costs.

2.245 NIE Networks has identified three substations which had equipment raised during RP5 as part of refurbishment schemes, these are:

- Whitla Street
- Dundonald; and
- Sprucefield

2.246 As NIE Networks has installed permanent flood defences at these sites as a result of its refurbishment technical specifications we do not believe it is correct that the outputs should be claimed against the D50 allowance causing NIE Networks to benefit financially through the D1 mechanism.

2.247 NIE Networks could have accelerated its flood defence programme with the savings it made during RP5 but chose not to do so. We are, therefore, compelled to classify three of the proposed RP6 sites as pre-funded in lieu of the above mentioned substations.

2.248 NIE Networks RP6 proposal and our draft & final determinations of direct investment in RP6 for connections driven system work are shown in Table 2.29 (see Annex P for details of units of measure, volume and unit cost).

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D50a	Permanent protection several distribution substations	1,105.938	1,105.938	737.292
D50b	RMU substations - provision of flood protection by raising the kiosk	2,600.000	1,092.000	1,092.000
D50 Total		**3,705.938**	**2,197.938**	**1,829.292**

Table 2.29 – Direct investment distribution substations permanent flood defences

Distribution Network Access and Commissioning

D605 Scope of work

2.249 At the outset of RP5 NIE Networks outsourced all operational activities to their subsidiary, NIE Powerteam. Part of NIE Networks' related party costs was a payment to NIE Powerteam called the "Managed Service Charge" (MSC). This transaction covered the costs of NIE Powerteam's technical engineers and "ops and outage".

2.250 The above cost categories were NIE Powerteam's costs for:

- commissioning new network components,
- routine system testing,
- fault location, and
- switching operations to allow access to the network

2.251 NIE Networks re-organised their operations during RP5 and absorbed NIE Powerteam into the core business. Although the transaction between NIE Networks and NIE Powerteam ceased, the costs covered by the MSC still exist within the core business.

D605 NIE Networks RP6 proposal

2.252 NIE Networks has set out its plans for investment in Distribution Network Access and Commissioning in Section 6.6 of its RP6 Network Investment Plan beginning at paragraph 1137. These plans are summarised in Table 2.30.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Network Access & Commissioning	Lump Sum			5,165.000

Table 2.30 – NIE Networks proposed investment in Network Access and Commissioning

D605 Draft determination

2.253 After discovering an error in their calculations, NIE Networks revised their RP6 proposal from £8.70m to £5.17m.

2.254 We calculated an allowance based on reported outturn expenditure between 2012/13 and 2015/16 extrapolated for the RP6 price control duration. When compared to our calculated figure the NIE Networks proposal was deemed to be acceptable.

D605 Final determination

2.255 NIE Networks made no comments on our draft determination and we have made no further revisions

2.256 Our final determination of direct investment in RP6 for network access and commissioning is shown in Table 2.31

Sub-programme	UoM	FD allowance(£k)
Network Access & Commissioning	Lump Sum	5,165.000

Table 2.31 – Direct investment in Network Access and Commissioning

3 Distribution ESQCR (D43)

General

3.1 The Electricity Safety, Quality and Continuity Regulations (Northern Ireland) were introduced in 2012 and outline the requirements for the network operator to (i) assess the risk posed by equipment, (ii) rectify specific issues, and (iii) take steps to make the public aware of dangers. Similar legislation was introduced in GB in 2002.

3.2 The timescales for compliance with the ESQCR legislative requirements are summarised in Table 3.1 below:

Date	Requirement
31 DEC 2014	Patrolling substations - Risk Assessment[23]
31 DEC 2017	Patrolling Overhead Lines - Risk Assessment
	Vegetation - safety (43-08)
31 DEC 2022	Fitting safety signs, stay insulators and anti-climbing devices on 11kV Poles.
	Fitting safety signs on LV poles and stay insulators where appropriate
	Fitting safety signs and anti-climbing devices on 33kV and 110kV Poles
On-going	Patrolling - Compliance inspection
	Establish Clearances: LV, 11kV and 33kV alterations
	Vegetation - resilience (ENA ETR132)
	Public Awareness

Table 3.1 – Timescales for Compliance with ESQCR legislation

Distribution Plant

D43g distribution transformers - Scope of work

3.3 This expenditure item relates to the requirement to reduce the risk of fire associated with oil filled distribution transformers located within integral buildings, where the adjacent units are populated.

3.4 In order to comply with legislation the existing mineral oil will be replaced by a modern synthetic ester based fluid which will provide the same level of cooling and insulation as the mineral oil but which has a much higher flash point. As the existing

[23] NIE Networks state that this is complete

transformers were designed to operate with mineral oil rather than synthetic ester the fluid replacement will be carried out only on transformers loaded to less than 80% of rating. Above this level of loading the transformers will need to be replaced with new ester filled transformers.

D43g distribution transformers - NIE Networks RP6 proposal

3.5 115 sites have been designated as High Risk, due to the risk of transformer fire, and transformers at these sites will be refilled with ester based fluid during RP6.

3.6 NIE Networks has set out its plans for investment in ESQCR Distribution Plant in Section 7.1 of its RP6 Network Investment Plan. These plans are summarised in Table 3.2 below.

Sub-programme	Description	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
D43g	Distribution Transformers	Each	115	4.000	**460.000**

Table 3.2 – NIE Networks proposed investment in ESQCR Distribution Plant

D43g distribution transformers – draft determination

3.7 We agree with the need for NIE Networks to undertake these works and that the options chosen are reasonable.

3.8 The costs proposed appear in line with industry norms.

D43g distribution transformers – final determination

3.9 NIE Networks made no comment on our draft determination and we have made no further revisions

3.10 Our final determination of direct investment in RP6 and the associated outputs for ESQCR Distribution Plant is shown in Table 3.3 below.

Sub-programme	Description	UoM	Volume	Unit Cost (£k)	FD allowance(£k)
D43g	Distribution Transformers	Each	115	4.000	**460.000**

Table 3.3 – Direct investment for ESQCR Distribution Plant

Very High Risk and High Risk Sites

D43c Very High and High Risk Sites - Scope of work

3.11 NIE Networks is required to undertake a formal risk assessment of its network as stipulated in regulation 3(2). A risk matrix has been developed to identify Very High and High risk sites in compliance with ESQCR and apply a hierarchy of mitigation measures to reduce the risk at these sites.

3.12 This sub-programme covers resolution of all identified very high and high risk sites during the RP6 period.

D43c Very High and High Risk Sites - NIE Networks RP6 proposal

3.13 NIE Networks has identified 19,373 pole sites through a combination of patrols and desk top survey. The assessment and application of the mitigation hierarchy identifies that 2,722 pole sites require network alteration and 16,651 require additional signing and guarding.

3.14 At the time of the latest submission NIE Networks has undertaken individual assessment on 872 pole sites and identified 486 projects to address these. The majority of projects address 1 or 2 pole sites but there are 10 projects that address over 5 pole sites with the largest addressing 17 pole sites.

3.15 Table 3.4 below shows NIE Networks' detailed breakdown of the cost build to address the very high and high risk sites as presented in their response to query URQ091.

ESQCR Location Type	No of Pole sites	Labour (£k)	Material (£k)	BIS (£k)	Total Direct Proposal(£k)
School	517	1,790.896	544.394	738.981	3,074.271
Caravan /Camping	152	2,839.999	783.871	1,633.883	5,257.753
Fishing Area	141	2,113.387	1,322.154		3,435.541
Playpark	62	1,097.451	767.866	1,879.637	3,744.954
Subtotal	**872**	**7,841.733**	**3,418.285**	**4,252.501**	**15,512.519**
The above 872 pole sites have been individually assessed					
Other Recreational Area	1,033	508.201	234.086	15.646	757.933
Industrial	2,044	201.806	42.513		244.319
Garden	14,881	2,043.154	442.790		2,485.944
Forestry	543	74.505	16.129		90.634
Subtotal	**18,501**	**2,827.666**	**735.518**	**15.646**	**3,578.830**
Total	**19,373**	**10,669.399**	**4,153.803**	**4,268.147**	**19,091.349**

Table 3.4 – NIE Networks proposed investment in ESQCR Very High and High Risk Sites

3.16 It is anticipated that the mitigation measures for high risk sites will be a combination of additional signage, enhanced anti-climbing devices and increased public awareness. While these mitigation measures will also be deployed at the Very High risk sites, this will only be an interim measure until a permanent solution is achieved.

D43c Very High and High Risk Sites – Draft determination

3.17 We have reviewed NIE Networks' proposals addressing the Very High and High risk sites.

3.18 We have discussed the risk assessment matrix and the application of a hierarchy of mitigation measures to address the risks with NIE Networks and we are satisfied that they have a reasonable process for identifying the sites and the required solution.

3.19 Given the types of sites that are covered by this work category and the variation in solutions comparative benchmarking of the overall "units" is not practical.

3.20 Ofgem requires the UK DNO to capture units and costs based on the solution category identified (shrouding, diversion, re-conductor, rebuild, underground and other) and assesses the average cost for each solution. NIE Networks have not built the programme based on these solution classifications.

3.21 NIE Networks provided a high level basis of costing for the individually assessed projects. We have reviewed a number of these and consider that the costs are in line with benchmark costs for the scopes identified.

3.22 Although the individually assessed pole sites account for only 4.5% of the identified Very High and High Risk sites they account for 81% of the total spend. The unit cost on the remaining 18,500 pole sites is approximately £200/pole site.

3.23 We will require NIE Networks to report against the identified projects and the overall very high and high risk sites. We will also require the outputs to be reported against the Ofgem solution categories to increase the availability of useful comparators in the future.

D43c Very High and High Risk Sites – Final determination

3.24 NIE Networks made no comment on our draft determination and we have made no further revisions

3.25 Our final determination of direct investment in RP6 for ESQCR High Risk Sites is shown in Table 3.5 (see Annex P for details of units of measure, volume and unit cost)

Sub-programme	Description	UoM	FD Allowance(£k)
D43c	Very High Risk Sites	Programme	19,091.349

Table 3.5 – Direct investment for ESQCR High Risk Sites

Overhead Lines and Vegetation Management

Overhead lines and vegetation management - Scope of work

3.26 The ESQC Regulations affect all parts of the distribution system but none more so than overhead lines. There are high volumes of safety sign, stay wire and clearance issues to resolve.

3.27 It is a legislative requirement to have a safety sign, anti-climbing device and stay insulator fitted, where required, by the end of 2022. It is anticipated that all other ESQCR compliance issues will be dealt with over the course of 3 price controls (by the end of RP8)

3.28 Due to the high volume of ESQCR compliance issues associated with LV overhead lines, NIE Networks are proposing to execute the ESQCR compliance programme in parallel with the refurbishment programme.

Overhead lines and vegetation management - NIE Networks RP6 proposal

3.29 NIE Networks has set out its plans for investment in ESQCR Overhead Lines and Vegetation Management in Section 7.2 of its RP6 Network Investment Plan beginning at paragraph 1188. These plans are summarised in Table 3.6 below.

Sub-programme	Description	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
D43a	Resolve stays and safety signs	Lump Sum			14,104.205
D43d	Resolve LV Clearances & Refurbish OHL	km	1,045	21.272	22,229.240
D43e	Resolve 11kV Clearances	km	9,100	0.350	3,203.200
D43f	Resolve 33kV Clearances	km	1,365	0.062	84.630
D43i	Provide 11kV Resilience Cut	km	843	1.115	939.945
D43j	Provide 33kV Resilience Cut	km	2,000	0.929	1,858.000
D43k	Provide S/S Resilience Cut	Sites	300	0.667	200.000
					42,619.220

Table 3.6 – NIE Networks proposed investment in ESQCR Overhead Lines and Vegetation Management

Overhead lines and vegetation management – Draft determination

3.30 NIE Networks provided a breakdown of volumes and costs for resolving safety sign and stay wire issues which we accepted and, although the allowance is issued as a lump sum, the outputs associated with this funding are that all legislative requirements will be met within the time-frame permitted and no further funding will be allowed to resolve stay wire or safety sign issues in the future except for business as usual maintenance programmes.

3.31 As mentioned in paragraph 2.128, NIE Networks propose to execute the ESQCR compliance programme in parallel with the LV overhead line refurbishment programme. NIE Networks also propose to introduce a new refurbishment specification which will ensure that all decayed poles are replaced during the refurbishment cycle instead of replacing only those with less than 3 years of remaining service life. This effectively doubles the volume of replacement poles and increases the unit cost per km of overhead line refurbished.

3.32 NIE Networks have provided no justification for the increased pole replacement costs nor have they indicated how this will benefit customers through improved service levels.

3.33 Due to the lack of local historic data with which to compare the proposed refurbishment costs coupled with ESQCR compliance costs we used industry median unit costs calculated by Ofgem for GB DNOs. Using the rates for:

i) Replace LV Main (OHL) Conductor;

ii) Replace LV Service (OHL);

iii) Replace LV Pole; and

iv) Refurbish LV Pole.

3.34 We calibrated our determination to take account of the RP5 pole replacement rate (15%) plus an additional 10% for sound poles being replaced for ESQCR clearance purposes. Using this method we found NIE Networks unit cost to be high.

3.35 We accepted the volumes for both 11kV and 33kV clearance resolutions as these align with the volumes of re-engineering/refurbishment proposed for RP6. NIE Networks' proposed unit costs are based on costs incurred whilst executing trial works. We have accepted these costs without challenge.

3.36 We compared the unit costs of both the 11kV and 33kV resilience tree cutting with the GB DNOs using DPCR5 Cost and Volumes RIGs reporting. We found NIE Networks costs to be acceptable after comparing them with a calculated industry median unit cost for ETR132 tree cutting activities.

Overhead lines and vegetation management – Final determination

3.37 In its response to our draft determination NIE Networks highlighted a number of issues with our approach to determining allowances for its ESQCR driven overhead line works. We deal with the issues identified as "errors" by NIE Networks in turn.

3.38 NIE Networks state[24] that we were in error not to use all of the trial data in our calculations

i) We stopped adding trial data to our analysis when the results of the additions stopped having an effect on the outcome

[24] Response to the Utility Regulator's Draft Determination, Annex 3.1, paragraph 5.9

3.39 NIE Networks state[25] that we were in error to use GB DNO data supplied by Ofgem as a comparator for the trial data given the variations in scope of work

i) The Ofgem data is not as detailed as the trial data supplied. NIE Networks claim that certain costs, such as traffic management, are not included in the Ofgem data but we find no evidence in the Ofgem definitions that excludes these costs from the totals. We are, therefore, of the opinion that the costs stated in the Ofgem data include all costs incurred by GB DNOs to execute the works.

ii) We accept that the costs of undergrounding mains and services may not be included in the Ofgem data. However, we found that the costs incurred by NIE Networks for these tasks are only 6.5% of the total costs.

3.40 NIE Networks state[26] that we were in error to base our calculations on the percentage of poles replaced in RP5.

i) We calculated the percentage of poles being replaced on the trial circuits for condition based reasons (decay) and also for clearance reasons (ESQCR) and found these to be:

- Decay – 30%
- ESQCR – 10%

ii) We then looked at what NIE Networks did during RP5 and found that it replaced 15% of poles on the LV system due to decay.

iii) We based our allowance on the full value ESQCR pole replacements plus the 15% decay replacement rate used during the RP5 LV refurbishment programme.

3.41 NIE Networks state[27] that its specification is now to replace all 'D' and 'S' classified poles on the LV system.

3.42 We find that if we calibrate our analysis to 40% pole replacement instead of 25% the outcome is very close to the allowance proposed by NIE Networks in its Network Investment plan.

3.43 We accept NIE Networks proposal to move to 40% pole replacement rate and, by definition, allow an increase in the determined allowance as proposed by NIE Networks.

3.44 All other allowances remain unchanged

3.45 NIE Networks original proposal and our draft & final determination of investment required for overhead lines and vegetation management is shown in Table 3.7 (see Annex P for details of units of measure, volume and unit cost).

[25] Response to the Utility Regulator's Draft Determination, Annex 3.1, paragraph 5.10
[26] Response to the Utility Regulator's Draft Determination, Annex 3.1, paragraph 5.14
[27] RP6 Network Investment Plan, Annex NIPX7.3, paragraph 3.1

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D43a	Fit Safety Signs (all voltages)	3,165.431	3,165.431	3,165.431
D43b	Stay wires (all voltages)	10,938.774	10,938.774	10,938.774
D43d	Address LV clearances & OHL refurbishment	22,229.240	19,203.965	22,229.240
D43e	Address 11kV clearances	3,203.200	3,203.200	3,203.200
D43f	Address 33kV clearances	84.630	84.630	84.630
D43i	11kV resilience cut	939.945	939.945	939.945
D43j	33kV resilience cut	1,858.000	1,858.000	1,858.000
D43k	S/S resilience cut	200.000	200.000	200.000
		42,619.220	**39,593.945**	**42,619.220**

Table 3.7 – Investment for ESQCR Overhead Lines and Vegetation Management

Cables

D43h Cables - Scope of work

3.46 The proposed funding is for the purpose of replacing existing 'looped' services with a separate service. NIE Networks has a legacy of 'looped' services where the main electricity connection to one property is provided by a 'looped' connection from an adjacent property normally through common walls between semi-detached homes using rubber insulated tails with no earth screen. These types of service are not compliant with ESQCR legislation

D43h Cables - NIE Networks RP6 proposal

3.47 The proposed solution is to install a new service to the looped property and the original service is to be retained. This allows removal of the unprotected cable through the party wall and also means that each property has an individual service which is more in line with current load requirements. NIE Networks estimate the volume of these looped services to be in the region of 10,000.

3.48 NIE Networks propose to replace 10% of the total number of looped services (1,000) during RP6.

3.49 NIE Networks has set out its plans for investment in ESQCR Cables in Section 7.3 of its RP6 Network Investment Plan. These plans are summarised in Table 3.8

Sub-programme	Description	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
D43h	0.4kV Cables (Looped Services)	Each	1,000	2.450	**2,450.000**

Table 3.8 – NIE Networks proposed investment in ESQCR Cables

D43h Cables – Draft determination

3.50 We have reviewed the NIE Networks plans and agree that the solution chosen to address this issue is appropriate and that the volumes are appropriate.

3.51 We have reviewed the unit costs proposed by NIE Networks and find them to be high. We consider that the works are equivalent to a replacement service with the addition of a new cutout. The Ofgem DPCR5 industry median unit cost for replacement services was £1,439 in 2015/16 price base. NIE Networks material cost for a cutout is £25. We therefore consider that an appropriate unit cost is £1,464 per service.

D43h Cables - Final Determination

3.52 After reviewing NIE Networks response to our draft determination and after further discussions with NIE we subsequently increased the allowances for this sub-programme.

3.53 In its response to our draft determination NIE Networks stated that the proposed cost "does not include for creating new entry point into the 'looped' property." and identified this as an error in our unit cost assessment.

3.54 NIE asserted that the Contractor rate to install the required duct is £500.

3.55 NIE provided a revised unit cost, together with a detailed scope and costing, of £1.97k.

3.56 We have reviewed the revised detailed scope and costs. The costs are in alignment with our draft determination plus additional allowance for the new entry point duct.

3.57 We therefore accept the revised NIE unit costs.

3.58 Our Final determination of direct investment in RP6 and the associated outputs for ESQCR Cables is shown in Table 3.9 .

Sub-programme	Description	UoM	Volume	Unit Cost (£k)	FD allowance(£k)
D43h	0.4kV Cables (Looped Services)	Each	1,000	1.970	**1,970.000**

Table 3.9 – Direct investment for ESQCR cables

3.59 We summarise NIE Networks proposal and our draft & final determinations for the entire RP6 ESQCR programme in Table 3.10 (see Annex P for details of units of measure, volume and unit cost)

Sub-programme	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
Distribution Plant	460.000	460.000	460.000
High Risk Sites	19,091.349	19091.349	19,091.349
Overhead Lines and Vegetation Management	42,619.220	39,593.945	42,619.220
Cables	2,450.000	1,464.210	1,970.000
	64,620.569	**60,609.504**	**64,140.569**

Table 3.10 – Investment for ESQCR programme

4 Distribution Network Reinforcement

D57a - Primary Network Projects

D57a - Scope of work

4.1 Load related primary network reinforcement is required to maintain compliance with statutory and licence obligations, primarily relating to thermal and voltage constraints on the network under intact and single circuit outage conditions.

D57a - NIE Networks RP6 proposal

4.2 NIE Networks has set out is plans for investment in Primary Network Reinforcement Projects in Section 8.1 of its RP6 Network Investment Plan beginning at paragraph 1239. These plans are summarised in Table 4.1 below.

33 kV Reinforcement Projects	Description	Proposed Costs (£k)
Armagh Main - Distribution Costs	Distribution costs associated with establishing Armagh Main 110/33kV substation	1,620.000
Airport Road	Establish 33kV substation at Airport Road to resolve load issues on the Belfast Central Main network	2,730.000
Belcoo 33/11kV Substation	Establish 33/11kV primary substation at Belcoo to resolve resupply issues associated with the single transformer site at Belleek South substation	1,970.000
Silverbridge West – Newtownhamilton East	Reinforce existing 33kV network to resolve voltage issues in the Silverbridge/Newtownhamilton area	660.000
Annsborough Central - Newcastle North	Install capacitor banks at Annsborough Central to resolve voltage issues on the Newcastle North/Annsborough Central 33kV network	250.000
Larne Main – Ballyclare Central	Build a new 33kV circuit from Larne Main to Ballyclare Central to resolve thermal and voltage issues associated with single circuit outages on the existing double circuit tower line.	1,260.000
Ballycastle Central	Install capacitor banks at Ballycastle Central to resolve voltage issues associated with single circuit outages on the 33kV network	290.000
Creagh Central	Install new 11kV circuits to transfer load from Creagh Central to Creagh Main	370.000
Cushendall Central	Reinforce 11kV network to provide resupply to Cushendall Central under fault conditions.	1,960.000
Poyntzpass Central	Replace existing 33/11kV transformers with 10/12.5MVA units to secure existing and future load at the site	460.000
Killyman Central	Replace existing 33/11kV transformers with 15/18.75MVA units to secure existing and future load at the site	550.000
Plumbridge Central	Install second transformer to enable site to	1,460.000

33 kV Reinforcement Projects	Description	Proposed Costs (£k)
	operate within licence standards under fault conditions	
Draperstown North	Install second transformer to enable site to operate within licence standards under fault conditions	830.000
Carnlough Central	Install second transformer to enable site to operate within licence standards under fault conditions	1,220.000
Ballyfodrin Central	Install second transformer to enable site to operate within licence standards under fault conditions	850.000
Derryleckagh Central	Install second transformer to enable site to operate within licence standards under fault conditions	1,400.000
TOTAL[28]		**17,856.129**

Table 4.1 – NIE Networks proposed investment in Primary Network Reinforcement Projects

D57a – Draft determination

4.3 For all proposed investments, NIE Networks provided a supporting annex, describing the need, optioneering and cost benefit analysis to support the investment. We used this information, together with load index data provided by NIE Networks for all substations and substation groups, to accept the proposed projects.

4.4 Proposed least cost reinforcements at Armagh Main and Airport Road included above are the distribution costs associated with transmission projects and we therefore move these two projects to the D5 mechanism. We recognise that should the transmission projects not proceed then the cost of the distribution solutions may be higher than the estimated amounts we have identified in the D5 mechanism. Regardless, we will assess the project costs if/when they are presented to us during RP6.

D57a Final Determination

4.5 NIE Networks made no comment on our draft determination and we have made no further revisions

4.6 NIE Networks original proposal and our draft & final determination of investment required for primary networks reinforcement is shown in Table 4.2 (see Annex P for details of units of measure, volume and unit cost)

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D57a	Primary Network Projects (33kV)	17,856.129	13,530.000	13,530.000

Table 4.2 – Direct investment in Primary Network Reinforcement Projects

[28] Does not total due to rounding of individual project costs

D57b & c - Secondary Network Expenditure and LCT

D57b 11/6.6kV and LV network load related - Scope of work

4.7 Load related 11/6.6kV and LV network reinforcement is required to maintain compliance with statutory and licence obligations, primarily relating to thermal and voltage constraints on the network under intact and single circuit outage conditions. NIE Networks also included modelled expenditures related to Low Carbon Technology uptake in this investment stream, we deal with this later in this section.

D57b 11/6.6kV and LV network load related - NIE Networks RP6 proposal

4.8 NIE Networks has set out is plans for investment in Secondary Network Reinforcement and LCT in Section 8.2 of its RP6 Network Investment Plan beginning at paragraph 1253.

4.9 NIE Networks has developed an 11/6.6kV risk register and an LV risk register. These tools allow the recording of identified network risks, assigning associated solutions and prioritisation of network reinforcements to address the most problematic areas. The highest priority schemes only are included for investment during RP6.

4.10 As the specific investments that form this plan are only determined during the investment period, for both 11/6.6kV and LV load related expenditure, NIE Networks proposed that a 'run rate' based on RP5 expenditure be applied.

4.11 The proposed investment costs based on the RP5 outturns are summarised in Table 4.3

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Load related 11/6.6kV Investment	Lump Sum			2500.000
Load Related LV Investment	Lump Sum			5800.000
				8,300.000

Table 4.3 – NIE Networks proposed investment in 11/6.6kV and LV network load related

D57b 11/6.6kV and LV network load related – Draft determination

4.12 We have reviewed the methodology developed by NIE Networks and accept the proposed load related investment in the 11/6.6kV and LV network based on the RP5 run rate.

D57b 11/6.6kV and LV network load related - Final Determination

4.13 NIE Networks made no comment on our draft determination and we have made no further revisions.

4.14 Our final determination of direct investment is shown in Table 4.4

Sub-programme	Description	UoM	FD Allowance(£k)
D57b	Load related 11/6.6kV & LV Investment	Lump Sum	8,300.000

Table 4.4 – Direct investment in 11/6.6kV and LV network load related

D57c Secondary network LCT - Scope of work

4.15 Low Carbon Technologies (LCTs) are designed to reduce the use of carbon fuels through the increased use of electricity for heating and transport e.g. heat pumps and electric vehicles. The scope of work is to identify reinforcements required to cater for these developments.

4.16 NIE Networks have utilised an industry recognised parametric model (TRANSFORM model) to forecast the uptake of LCTs and identify the likely reinforcements required to accommodate these connections. This model has been configured to reflect the electricity network in Northern Ireland and forecast scenarios of LCT uptake that have been developed by NIE Networks' consultants.

4.17 TRANSFORM predicts which elements in the parametric model will exceed their design parameters and presents a probabilistic view of the expenditure requirement to meet the chosen scenario.

4.18 NIE Networks presented expenditure requirements based on the low uptake scenarios, with a further reduction of 10% on the electric vehicle forecast.

D57c Secondary network LCT - NIE Networks RP6 proposal

4.19 NIE Networks has set out is plans for investment in Secondary Network LCT in Section 8.2 of its RP6 Network Investment Plan beginning at paragraph 1317. These plans are summarised in Table 4.5

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Allowance(£k)
LCT related 11 & 6.6 kV Investment	Lump Sum			11,700.000
LCT related LV Investment	Lump Sum			1,500.000
				13,200.000

Table 4.5 – NIE Networks proposed investment in Secondary Network LCT

D57c Secondary network LCT – Draft determination

4.20 We have reviewed the methodology used by NIE Networks to develop the parametric model and the scenarios used in TRANSFORM.

4.21 We note that the expenditure requirements forecast fall specifically on two main areas. The 11/6.6kV investments are predominantly forecast to be required due to overloading of small primary transformers and the LV Investment is predominantly due to overloading of distribution transformers.

4.22 The main driver for the investment in the model in the RP6 period appears to be electric vehicle charging point connections.

4.23 NIE Networks accept that at present they do not have the mechanisms to forward forecast specifically where LCT investment will be required in the year identified by the TRANSFORM model, but anticipate developing systems to achieve this by midway through the RP6 period. There will, therefore, be a delay between identification of the LCT driver and the reinforcement requirement being made.

4.24 Due to the level of uncertainty in the uptake of LCTs and the growth trajectories towards the end of RP6, our draft determination is on the basis of allowing proposed investment to March 2021, based on investment being made in the year after the need is predicted by TRANSFORM. We will re-evaluate NIE Networks' requirements as described in section 13 of the main document under "Load Re-openers".

D57c Secondary network LCT – Final determination

4.25 After reviewing NIE Networks response to our draft determination and following additional meetings with NIE we have decided to maintain the allowance at the draft determination level but clarify the timing and application of the re-evaluation.

4.26 In its response to our draft determination NIE Networks stated that they disagreed with our assertion that the investment would occur the year after the need is predicted by the transform model.

4.27 To support this NIE stated that for large investments such as transformer replacements RP5 projects "show cash flow commences within 3 months of the project being sanctioned and 94% of the expenditure occurring within seven months of the project sanction".

4.28 We do not dispute the timing of expenditure after sanction on such projects and explained at meetings with NIE that we do not consider that the expenditure will be delayed by 12 months but that the load that is connected through the year will become evident to NIE at the time of the winter peak Dec/Jan and they will then prepare and sanction a scheme in the at the start of the calendar year that will start to incur cost at the start of the next regulatory year in April. So the delay is only 3 months but crucially it takes the expenditure into the next regulatory period.

4.29 NIE also state that they have started to collect data on LCT installations. However from meetings with NIE it is understood that it is unlikely that NIE will be in a position to proactively use this to forecast reinforcement before the midpoint re-evaluation.

4.30 Should the £4.84 million request be allowed then there is a significant risk to customers that the application of the 50:50 cost risk sharing mechanism will mean that they are funding expenditure that will not be made through NIE not having the systems in place to predict where expenditure will be required and then funding the same expenditure again 3 months later after the re-evaluation is allowed.

4.31 If NIE have confidence in the proactive forecasting of LCT uptake at the re-evaluation stage and then re-running the model with 4 years additional historic trend data and improved knowledge on the impact of any government incentives on the forecast uptake of LCT should allow a robust forecast to the end on the period.

4.32 We therefore retain our position on timing of the expenditure and the effect on the total costs up to March 2021.

4.33 NIE requested clarification on the timing of the reopener to ensure that they were in a position to sanction projects required for April 2021.

4.34 It is proposed to undertake the TRANSFORM re-evaluation in October 2020

4.35 NIE Networks original proposal and our draft & final determination of investment required for primary networks reinforcement is shown in Table 4.6

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D57c	Secondary Network (11,6.6kV & LV) LCT Related	7,285.906	2,600.000	2,600.000

Table 4.6 – Direct investment for secondary network LCT related

D57d - Fault Level

D57d - Scope of work

4.36 The driver for this investment is to ensure that all items of switchgear on the NIE Networks distribution system from 33kV down to 6.6kV level are operated within their fault level rating.

D57d - NIE Networks RP6 proposal

4.37 NIE Networks has set out its plans for investment in Fault Level Reinforcement in Section 8.3 of its RP6 Network Investment Plan beginning at paragraph 1335. These plans are summarised in Table 4.7

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Fault Level Reinforcement	Lump Sum			**1,830.000**

Table 4.7 – NIE Networks proposed investment in Fault Level Reinforcement

D57d– Draft determination

4.38 NIE Networks have proposed fault level reinforcement for any equipment currently identified to exceed its fault rating by 90%.

4.39 We make reference to Ofgem document 'Strategy Consultation for the RIIO-ED1 electricity distribution price control – Tools for cost assessment – Supplementary annex to RIIO-ED1' which states under paragraph 5.89 'Historically, forecasting the level and likely location of fault level issues has been difficult. As a result previous baselines have been set based on known issues at the time of the price control process. This has usually been based around the number of switchboards and substation busbars that have at least one item of switchgear that is experiencing a fault current level that exceeds 95 per cent of its current fault rating.'

4.40 With Ofgem's consultation document concluding under paragraph 5.91 that 'We propose to set initial baselines for Fault Level Reinforcement based on known issues affecting the network at the time the business plan is submitted.'

4.41 We agree with Ofgem's position and our determination is to accept NIE Networks fault level reinforcements for assets exceeding 95% of fault rating at the time of submission.

D57d– Final determination

4.42 In its response to our draft determination NIE Networks disagreed with our approach of basing the allowance on assets exceeding 95% of fault rating at the time of submission stating 'the 5% tolerance between nameplate rating and operational conditions provides an unacceptably narrow safety margin. Accordingly, equipment must be disconnected and managed off the network once it approaches this point'.

4.43 Four stations proposed for replacement in RP6 currently exceed 100% of fault duty as identified by NIE Networks RP6 Networks Investment Plan. Discussions with NIE Networks identified that where the fault level exceeds 95% operation restrictions are applied to the assets to manage the risk. NIE Networks allow this 5% safety margin for the potential for data error, unknown customer contribution and reduced fault level capability of aged equipment.

4.44 Having reviewed the latest information, we maintain our position, in agreement with Ofgem's position and our final determination is to accept NIE Networks fault level reinforcements for assets exceeding 95% of fault rating at the time of submission. For the assets that are not at 95% of rating at the start of the RP6 period but may exceed 95% of rating on 'Make' duty during RP6 then NIE has an existing policy of operational restrictions to manage the risk for such assets and we see no reason why this should change.

4.45 NIE Networks original proposal and our draft & final determination of investment required for primary networks reinforcement is shown in Table 4.8

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D57d	Fault Level Investment	1,830.984	1,700.000	1,700.000

Table 4.8 – Direct investment in Fault Level Reinforcement

4.46 We summarise our final determination of the D57 Category in Table 4.9 (see Annex P for details of units of measure, volume and unit cost)

Sub-programme	Description	RP6 Proposal (£k)	RP6 Allowance (£k)
D57a	Primary Network Projects (33 kV)	17,856.129	13,530.000
D57b & c	Secondary Network (11/6.6kV & LV) Load Related & LCT Expenditure	21,482.711	10,900.000
D57d	Fault Level Investment	1,830.984	1,700.000
Total		**41,169.824**	**26,130.000**
Airport Rd & Armagh Main projects moved to D5 mechanism			4,350.000
LCT funding moved to mid-term review[29]			10,500.000
Total including uncertainty mechanism		**41,156.129**	**40,980.000**

Table 4.9 – Direct investment for distribution reinforcement

[29] NB. Should scenarios strengthen based on uptake of government initiatives then the reopener may be more than the current balancing figure.

D601 33kV Congestion

D601 - Scope of work

4.47 Due to forecast load erosion and the connection of further distributed generation, reverse power flows on the 33kV network may exceed statutory operating limits under intact and single circuit outage conditions.

D601 - NIE Networks RP6 proposal

4.48 NIE Networks has set out its plans for investment in 33kV Congestion in Section 8.4 of its RP6 Network Investment Plan beginning at paragraph 1351. These plans are summarised in Table 4.10 below.

Sub-programme	UoM	Total Direct Proposal(£k)
33kV Congestion	Lump Sum	**10,421.000**

Table 4.10 – NIE Networks proposed investment in 33kV Congestion

D601– Draft determination

4.49 NIE Networks proposed 33kV congestion reinforcement requirements are based on the scenario of zero demand and concurrent maximum generation output. Sensitivity analysis has been provided for 75%, 50% and 25% of historic minimum demand.

4.50 Our draft determination is on the basis of proposed reinforcements required when considering 75% of historic minimum demand, reflecting an average load erosion of 25% on current levels within the price control period. We believe this is a more appropriate assessment in the time scales of the RP6 period.

4.51 It is appreciated that there may be specific local factors that mean a zero demand scenario occurs, but this should not be the scenario which is used for all substations. Some substations will face more onerous conditions than this scenario and some less onerous. Load erosion rates as a result of energy efficiency may also be combatted by the take up of LCTs.

4.52 The required reinforcements were not particularly sensitive to load erosion rates with 9 of the 12 specific projects required when considering a minimum demand of 75% of current levels.

D601– Final determination

4.53 In its response to our draft determination NIE Networks disagreed with our approach of utilising a 25% reduction in minimum demand to determine necessary projects for reinforcement as a result of 33 kV reverse power flows.

4.54 In the response and subsequent discussions, NIE Networks provided additional evidence regarding the magnitude of load erosion, no-load customer requests and scenarios where overloading could feasibly occur.

4.55 Having reviewed the latest information, we decided that the zero load planning study case is viable and to therefore include the two schemes which we excluded from our draft determination. Our final determination is on a project specific basis for this allowance and not a lump sum arrangement.

4.56 NIE Networks original proposal and our draft & final determination of investment required for primary networks reinforcement is shown in Table 4.12(see Annex P for details of units of measure, volume and unit cost)

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
D601	33kV Congestion	10,421.020	8,900.000	10,421.020

Table 4.11 – Draft determination of direct allowance and outputs for 33kV Congestion

D602 Investing for the Future

D602 - Scope of work

4.57 Proposed plans for innovative technologies to be trialled, focussing on integrating suitably advanced smart solutions into business as usual activities.

D602 - NIE Networks RP6 proposal

4.58 NIE Networks has set out is plans for investment in 'Investing for the Future' in Section 8.5 of its RP6 Network Investment Plan beginning at paragraph 1376. These plans are summarised in Table 4.12 below.

Sub-programme	Trial Sites/Deliverables	Direct Costs (£k)
Smart Asset Monitoring	$4N^{o}$ Traffo + $2N^{o}$ OHL	1,160.000
Demand Side Response	4	1,300.000
LV Active Network Management	4	1,600.000
Voltage Management	1 (SVC/STATCOM) 5 DVRC	2,220.000
Facilitation of Energy Storage Services	0 (Literature & Policy Review only)	300.000
Forward investment in Communications Infrastructure	50% of RTUs	3,900.000
		10,480.000

Table 4.12 – NIE Networks proposed investment in 'Investing for the Future'

4.59 For all projects, with the exception of the facilitation of energy storage services, cost benefit analysis was provided to justify the expenditure in the innovative projects. As no cost benefit analysis was provided to support it, and the scope of the energy storage services project is considered to be a business as usual activity as new connections are requested, the costs associated with this project have been excluded from our draft determination.

4.60 The NIE Networks proposals include direct staff costs to support the innovative projects. NIE Networks have not provided evidence to detail how these additional staff costs are considered outside of existing indirect allowances via non job costed employees. NIE Networks manpower costs are therefore excluded from our draft determination in relation to investing in the future expenditure.

4.61 NIE Networks are replacing 50% of the existing RTUs under the RP6 Network IT and Telecommunications programme. In this investment programme, 'Forward investment in communications infrastructure' relates to the proposed advancement of upgrades to the remaining 50% of the RTU population in RP6 to facilitate the use of innovative solutions over conventional only solutions in addressing LCT investment requirements.

4.62 We note that in the TRANSFORM model the smart solutions are made available to the model in the following years.

Project	Solution	Available from
EAVC & STATCOM	D-FACTS – EHV connected STATCOM	2020
	D-FACTS – HV connected STATCOM	2020
DSR	DSR_DNO to Central business District DSR	2020
	DSR - DNO to residential	2020
	DSR_DNO to aggregator led EHV connected commercial DSR	2020
	DSR_DNO to EHV connected commercial DSR	2020
	DSR_DNO to aggregator led HV commercial DSR	2020
	DSR_DNO to HV commercial DSR	2021
RTTR	RTTR for EHV Overhead Lines	2020
	RTTR for EHV/HV transformers	2021
	RTTR for HV Overhead Lines	2020
LV ANM & MESHING	Permanent Meshing of Networks - LV Urban	2021
	Permanent Meshing of Networks - LV Sub-Urban	2021
	Temporary Meshing (soft open point) - LV	2021
	Active Network Management - LV	2021

Table 4.13 – NIE Networks SMART solution availability

4.63 We have analysed the forecast marginal costs associated with conventional reinforcements due to delaying RTU replacements against the use of smart solutions already included in the TRANSFORM model expenditure forecast. This analysis shows that an optimised RTU reinforcement rollout could be achieved with

replacement of 50% of the proposed RTUs in the latter half of the RP6 period and the remainder of the population in the first half of the RP7 period.

4.64 Our draft determination of direct allowance in RP6 and the associated outputs for 'Investing for the Future' is shown in Table 4.14

Sub-programme	Direct Costs (£k)
Smart Asset Monitoring	740.000
Demand Side Response	1,190.000
LV Active Network Management	1,450.000
Voltage Management	1,930.000
Facilitation of Energy Storage Services	0.000
Forward investment in Communications Infrastructure	1,950.000
	7,260.000

Table 4.14 – Draft determination of allowance and outputs for 'Investing for the Future'

4.65 However, we have concluded that there is further work to do to confirm that the projects proposed will deliver value and that the company should complete this work and submit the results to us before embarking on the procurement of assets and systems and the trials themselves. For example:

i) The cost benefit analysis submitted by the company to support the work proposed addressed the application of the technology in a single case assuming that the trial had been successful. The company should assess the potential application of each type of technology it proposes to trial, take account of the risk of the trial not being successful and consider the net-present value of the costs and benefits over the life of the relevant assets.

ii) In its submission, the company has highlighted technical issues which arose in some of the innovation projects carried out in GB which do not appear to have been resolved. The company should show how these technical issues can be resolved either within or outwith the proposed trial.

iii) The scope of works which the trials will deliver should be confirmed. For example, whether all software and systems necessary to manage information flow will be procured during the trials or whether additional procurement will be required. This should be built into the cost benefit analysis described above.

iv) The company has noted that the trials will be carried out on assets which are not at the limit of load because the company cannot yet confirm that the solution being trialled will work. Where an immediate solution is necessary a 'traditional' asset replacement or reinforcement is planned. However, the company should show that the trials it plans to carry out can fully test the equipment and systems over a full range of operating conditions allowing them to be applied in practice.

v) While the company does not plan to use the trial work as a means of delivering RP6 planned network investment outputs, we expect the company to deliver the solutions outlined in the programme of work as permanent solutions which could provide benefit in the long term.

vi) The company should set out the programme for the trials. We would expect the trials to inform the assessment of the LCT load reopener set out in paragraph 4.15.

vii) In general, the trials should be sufficient to inform future application. It should address the generic technology (as opposed to the specific type tested). It should be complete in that any recommendations for further research necessary to implement the trials should be carried out under the RP6 allowance subject to the cost risk sharing mechanism.

D602 – Final determination

4.66 In its response to our draft determination, NIE Networks raised four areas of concern which are outlined as:

- Exclusion of FESS project costs
- Exclusion of NIE Networks indirect costs
- Replacement of RTUs
- The UR's request for further work to confirm that the projects proposed will deliver value

4.67 We deal with the issues identified by NIE Networks in turn.

Exclusion of FESS project costs

4.68 NIE Networks disagreed with our view that this be regarded as BaU activity. Energy storage is both a load and a generation export connection and is at early stages of development and implementation.

4.69 After reviewing NIE Networks response to our draft determination, we agree that this should not be regarded as BaU activity and we decided to provide the allowance of £0.3m for this sub-programme

Exclusion of NIE Networks indirect costs

4.70 NIE Networks disagreed with our exclusion of indirect costs associated with D602. In their response, NIE Networks make reference to guidance document 'RIIO-ED1 regulatory instructions and guidance: Annex B – Costs and Volumes' outlining that NIE Networks have followed this approach, similar to innovation projects in GB in relation to RIIO-ED1

i) After reviewing NIE Networks response, we have clarified that indirect costs associated with D602 have not been considered elsewhere within the

submission and have been identified in accordance with similar innovation projects in GB for RIIO-ED1.

ii) NIE Networks indirect costs associated with D602 are considered reasonable with exception to items for detailed scoping and transition into BaU tasks for five innovation projects, which we consider inappropriate. Reference is made to comparing estimated FESS costs associated with the same tasks which are seen to be 50% less than other innovation projects. These tasks are supported by an equivalent consultancy cost and applicable to all innovation projects such that we would expect levels of efficiency to be made available across the tasks.

4.71 We decided to allow the full NIE Networks indirects allowance for D602, minus 50% of detailed scope and transition to BaU task costs, an increase of £0.75m.

Replacement of RTUs

4.72 NIE Networks disagreed with our analysis of offsetting roll out of RTU replacements. NIE clarified that due to the communication infrastructure the IP functionality of the RTUs cannot be utilised until the whole asset base is converted to IP compatible devices. Therefore our phasing of smart solutions benefits in the CBA was in error.

i) After reviewing NIE Networks response to our draft determination, we agree smart solutions could not be available until all RTUs have been replaced. We have reviewed our cost benefit analysis and agree that replacement of all RTUs in the RP6 period is the preferred option. We have therefore decided to increase the allowance from £1.95m to £3.90m for this sub-programme

4.73 We decided that the replacement of RTUs should be funded with an ex-ante allowance but the other sub-programmes will be subject to a reopener based on NIE Networks providing a more comprehensive schedule of execution and criteria defining the success or failure of the trials

4.74 We summarise NIE Networks proposal and our draft & final determinations for the D603 programme in Table 4.15 (see Annex P for details of units of measure, volume and unit cost)

Sub-programme	NIE Networks proposed allowance (3k)	Draft Determination (£k)	Final Determination (£k)
Innovation projects	6,566.000	5,310.000	6,360.000
Forward investment in Communications Infrastructure	3,900.000	1,950.000	3,900.000
	10,466.000	**7,260.000**	**10,260.000**

Table 4.15 – Direct investment for 'Investing for the Future'

5 Distribution Network Optional Expenditure

5.1 In its business plan, the company identified a further £45.4m of investment which is categorised as 'optional' which it did not include in its plans for RP6. This investment is summarised in Table 5.1.

	Optional investment £m	Notes
Investment to strengthen the 11kV overhead line network.	25.6	Phased replacement of 25mm conductors on the spine of the 11kV overhead line network with 50mm conductors to address capacity and potential failure under ice loads.
Additional investment to improve flood resilience.	2.6	Improved flood resilience at 200 sites which serve 4000 consumer.
Acceletrated resilience tree cutting.	0.7	Resilience tree cutting will reduce the risk of falling trees causing damage to the network. The optional investment is to accelerate resilience tree cutting over a period of 20 years rather than the planned 25 years.
Further investment to reduce unplanned power cuts.	16.5	The company suggested that investment in additional generators (£1.0m) and investment in additional dedicated resources available for fault and emergency response (£11.5m) would reduce the 5000 homes and businesses experiencing an power cut of over 10 hours by 25%. Investment of a further £5.0m improving cirucits serving worst served customers would (those affected by 6 or more power cuts in an 18 month period) by 20%.
Total 'optional' investment	45.4	

Table 5.1: Optional network investment proposed by NIE Networks

5.2 The company presented these programmes of investment as optional[30]:

> *"because the investments received mixed levels of support during our customer and stakeholder engagement process. Domestic customers surveyed were generally supportive of the programmes and willing to pay for improvements, whilst business customers supported improvements in principle but the majority were not willing to pay for these improvements."*
>
> *"given other competing priorities in our core plan, we have decided to include these projects as optional."*

5.3 We note the company's view that this investment is optional because they are not fully supported by consumer engagement and because of the other competing priorities in the core plan. It is for the company to assess the needs of its consumers including their willingness to pay and the balance of competing priorities in its business plan. In view of this, we have not included this investment in the draft

[30] Source NIE Networks RP6 business plan 2017-2024, 8.2 and 8.3

determination. Direct network investment outputs and incentives and uncertainty mechanisms.

5.4 In summary, our approach to this issue takes due account of the outcome of the consumer engagement process and the balance of views that consumers expressed. The company has not presented a compelling case for the investment and, in particular, has not considered it necessary to complete a cost benefit analysis which would balance the benefits associated with these projects against the impact on consumers' tariffs.

6 Transmission Expenditure

Major Transmission Projects

Major transmission projects - Scope of work

6.1 In its final determination for RP5, the Competition Commission defined a "D5 Mechanism" to allow for additional investment projects to increase the capacity and capabilities of NIE's transmission system. The details of the mechanism are set out in the RP5 final determination from paragraph 5.246.[31].

6.2 While the D5 project was primarily designed for additional investment to increase the capacity and capability of the transmission, its use was extended to named major transmission maintenance projects whose need had been established but where the scope, cost and programme had yet to be established.

6.3 In this section we note the need for four major transmission projects expected to incur expenditure in RP6 (the completion of investment in one D5 project determined in RP5 and three major maintenance transmission projects) as follows:

i) T501 - Ballylumford Power Station Switchboard

ii) T502 - Coolkeeragh Power Station – Magherafelt 275kV Overhead Line

iii) T503 – Omagh Tamnamore 110kV overhead line – D5

iv) T601 - Ballylumford Power Station to Castlereagh 110kV Overhead line

T501 - Ballylumford Power Station Switchboard
T502 - Coolkeeragh Power Station – Magherafelt 275kV Overhead Line

6.4 In its determination for RP5 the Competition Commission concluded that an allowance for these major transmission maintenance projects should be determined under the D5 mechanism when the company had developed the scope of the project and was in a position to prepare a reasonable scope and cost estimate. Neither of these projects has been undertaken in RP5 and NIE Networks now plans to undertake the work in RP6.

6.5 In view of the continuing uncertainty over the scope and cost estimate of these projects, we have concluded that they should be dealt with under the D5 mechanism in RP6. For the purpose of estimating tariffs, an allowance of £16.0m and £25.8m (pre-frontier shift) was included in the financial model the determination. These are

[31] https://assets.publishing.service.gov.uk/media/535a5768ed915d0fdb000003/NIE_Final_determination.pdf

ring fenced allowances to be replaced with ex-ante allowances which will be determined under the D5 mechanism.

T503 – Omagh Tamnamore 110kV overhead line – D5

6.6 An allowance for Omagh Tamnamore 3rd circuit was determined in RP5 at £21.865m in 2015/16 prices. This allowance has been profiled in proportion to the current estimated expenditure profile reported by the company in response to a query on the business plan.

6.7 The company's current estimate is that £1.0m of this investment will be made in the first year of RP6. This has been taken into account in our analysis for RP6 pending confirmation of actual expenditure which will be used in the calculation of future tariffs.

T601 - Ballylumford Power Station to Castlereagh 110kV Overhead line

6.8 The company provided an estimate for the refurbishment of this project in its business plan submission but has since identified a major risk associated with the existing foundations following similar investigations on the Coolkeeragh - Magherafelt transmission line refurbishment project. In addition, the project may be subsumed into a transmission capacity project.

6.9 In view of the uncertainty over the scope and cost estimate of this project, we have concluded that it should be dealt with under the D5 mechanism in RP6. For the purpose of estimating tariffs, an allowance of £11.8m was included in the financial model for the determination. This is a ring fenced allowance to be replaced with an ex-ante allowance which will be determined under the D5 mechanism.

General Transmission Asset Replacement

T06 - Transmission Plant Switch Houses

T06 - Scope of work

6.10 There are 3 transmission plant switch houses in commission on NIE Networks' system:

- 275kV switch house at Ballylumford
- 275kv switch house at Kilroot
- 110kV switch house at Ballylumford

6.11 The buildings are metal framed and house the open terminal switchgear at the generating plants.

6.12 The cladding on the buildings is manufactured from “Galbestos” which is a galvanised steel sheet coated in an asbestos felt and finished with a layer of polyester or bitumen. NIE Networks state that the cladding on all three buildings is now in a poor state of repair due, mainly, to saline corrosion as a result of being situated in coastal locations. The deterioration of the cladding is now becoming a safety issue given the risk of release of asbestos fibres.

T06 - NIE Networks RP6 proposal

6.13 NIE Networks has set out its plans for investment in Transmission Plant Switch Houses in Section 10.2 of its RP6 Network Investment Plan beginning at paragraph 1566. These plans are summarised in Table 6.1 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Refurbish substation buildings and associated works (Kilroot)	Site	1	350.000	**350.000**

Table 6.1 – NIE Networks proposed investment in Transmission Plant Switch Houses

T06 – Draft determination

6.14 NIE Networks forecast to complete the cladding of 1.5 buildings during RP5 at a cost of £1.6m. This equates to a unit cost per building of around £1m. Therefore, NIE Networks’ proposal to complete the remaining 50% of replacement cladding at Kilroot switch house at a cost of £350k appears to be reasonable.

6.15 Although the allowance is issued as a lump sum, we still require reporting of output during the RP6 period.

T06 – Final determination

6.16 NIE Networks made no comment on our draft determination.

6.17 We decided to change the classification of this programme from ‘lump sum’ to ‘project’. We did this to highlight the fact that this is a named programme

6.18 Our final determination of direct investment in RP6 and the associated outputs for Transmission Plant Switch Houses is shown in Table 6.2

Sub-programme	Sub-programme	UoM	Total Direct Allowance(£k)
T06b	Refurbish substation buildings and associated works (Kilroot) including the removal of all Galbestos cladding	Project	**350.000**

Table 6.2 – Draft determination of investment and outputs for Transmission Plant Switch Houses

T10 - 110kV Switchgear Replacement

T10 - Scope of work

6.19 In RP4 NIE Networks began a programme of replacing Reyrolle Small Oil Volume (SOV) 110kV circuit breakers. These items of switchgear are required to isolate sections of network in the event of a fault and are therefore subjected to high current operations.

6.20 The switchgear was installed during the 60's and 70's in outdoor locations and is now showing signs of age related wear. NIE Networks also claim that the acquisition of spare parts is becoming problematic as the original equipment manufacturer is no longer supporting this type of switchgear.

6.21 National Grid is also undertaking a programme of replacing Reyrolle SOV circuit breakers.

T10 - NIE Networks RP6 proposal

6.22 NIE Networks has set out its plans for investment in 110kV Switchgear Replacement in Section 10.2 of its RP6 Network Investment Plan beginning at paragraph 1574. These plans are summarised in Table 6.3 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Replace 110kV Switchgear	Each	11	420.000	**4,620.000**

Table 6.3 – NIE Networks proposed investment in 110kV Switchgear Replacement

T10 – Draft determination

6.23 In the Network Investment RIGs NIE Networks have reported expenditure but no completed outputs; however, in paragraph 97 of the RP6 Network Investment Plan it

is clearly stated that 9 outputs are complete (8 at Dungannon Main and 1 at Lisburn Main)

6.24 We used the outputs and expenditure mentioned above to calculate an outturn unit cost.

6.25 We accepted the proposed RP6 volume as NIE Networks presented a strong technical justification; however, we found the proposed unit costs to be high when compared to the RP5 outturn unit cost.

T10 – Final determination

6.26 After reviewing NIE Networks response to our draft determination and the 5 year outturn data we maintained the volumes as stated in our draft determination and subsequently increased the allowance for this programme.

6.27 In its response to our draft determination NIE Networks stated that we "*failed to have regard to the latest available RP5 outturn data*"

6.28 We deal with the issues identified as "errors" by NIE Networks in turn.

6.29 NIE Networks state that we were in error to use the information in its network investment plan as a guide to determine an allowance owing to the fact that the costs were not complete.

i) We reviewed the 5 year outturn data and found that there was evidence that the unit cost for this programme was in fact higher than we allowed in the draft determination

6.30 NIE Networks further state that increased ancillary costs at Strabane substation should be taken into account when determining this allowance

i) Our view is that this allowance is for the replacement of 110kV switchgear and should not include bespoke costs which differ between price controls.

ii) We accept that there will be variations in cost from project to project which is why we have taken the approach of basing the allowances on outturn average costs where possible

iii) We believe that NIE Networks has sufficient flexibility in its ancillary allowances to be able to carry out the necessary works.

6.31 NIE Networks original proposal and our draft & final determinations of direct investment in RP6 for 110kV switchgear replacement is shown in Table 6.4 (see Annex P for details of units of measure, volume and unit cost)

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
T10c	110kV Switchgear	**4,620.000**	**3,452.229**	**3,697.771**

Table 6.4 – Direct investment for 110kV Switchgear Replacement

T11 - 275kV Plant Ancillaries

T11 - Scope of work

6.32 275kV substations require many ancillary systems to enable safe and reliable operation, these include:

- LV AC supply to run lighting, heating, battery charging and building services
- LV DC supply to run protection and communication systems
- Standby generator for emergency back up and black start services
- Water service for staff facilities
- Sewerage system (not in all substations)
- Drainage
- Security

6.33 During RP4 and RP5 a rolling programme of refurbishment and replacement of substation ancillary components was undertaken.

T11 - NIE Networks RP6 proposal

6.34 NIE Networks has set out its plans for investment in 275kV Plant Ancillaries in Section 10.2 of its RP6 Network Investment Plan beginning at paragraph 1580. These plans are summarised in Table 6.5 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Replace catenary	Site	3	250.000	750.000
Remove asbestos	Lump Sum			100.000
Refurbish concrete structure	Site	3	133.333	399.999
Refurbish transformer bunds	Site	3	200.000	600.000
Replace security system	Lump Sum			100.000
Refurbish DC standby system	Lump Sum			268.790
Refurbish/upgrade earthing system	Site	5	20.000	100.000
Rewire AC system	Site	2	42.596	85.192
Refurbish control room	Site	3	25.000	75.000
Refurbish/upgrade drainage	Site	1	100.000	100.000
Replace 275kV CVT including line trap (Ballylumford)	Each	6	25.908	155.448
Replace CT (Kilroot)	Each	33	26.498	874.434
Replace 275kV disconnector (Hannahstown)	Each	12	75.000	900.000
Refurbish 22kV Capacitor Bank	Lump Sum			25.000
				4,533.863

Table 6.5 – NIE Networks proposed investment in 275kV Plant Ancillaries

T11 – Draft determination

6.35 We accepted the volumes and unit costs for all sub-programmes based on the fact that the total proposed amount is less than that allowed for RP5 when taken as annual spend per annum.

6.36 Most of the outputs defined in the RP5 final determination for this sub-programme were “Specified improvement at specified location(s)”. Unfortunately, NIE Networks’ RP5 business plan submission did not specify any volumes; subsequently we have limited data with which to form a comparison.

T11 – Final determination

6.37 NIE Networks made no comment on our draft determination.

6.38 After reviewing the 5 year outturn data we found that a reduction in one of the sub-programme allowances was warranted

6.39 We noted that NIE Networks was allowed a sum of £400k to refurbish one transformer bund at Ballylumford substation and this work was subsequently delivered for £80k.

6.40 We have based the RP6 final determination on this amount

6.41 NIE Networks original proposal and our draft & final determinations of direct investment in RP6 for 275kV Ancillaries are shown in Table 6.6 (see Annex P for details of units of measure, volume and unit cost)

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
T11a	Replace catenary	750.000	750.000	750.000
T11c	Remove asbestos	100.000	100.000	100.000
T11d	Refurbish concrete structure	399.999	399.999	399.999
T11e	Refurbish transformer bunds	600.000	600.000	240.000
T11g	Replace security system	100.000	100.000	100.000
T11i	Refurbish DC standby system	268.790	268.790	268.790
T11k	Refurbish/upgrade earthing system	100.000	100.000	100.000
T11l	Rewire AC system	85.192	85.192	85.192
T11m	Refurbish control room	75.000	75.000	75.000
T11n	Refurbish/upgrade drainage	100.000	100.000	100.000
T11o	Replace 275kV CVT including line trap (Ballylumford)	155.448	155.448	155.448
T11p	Replace CT (Kilroot)	874.434	874.434	874.434
T11q	Replace 275kV disconnector (Hannahstown)	900.000	900.000	900.000
T11r	Refurbish 22kV Capacitor Bank	25.000	25.000	25.000
T11 Total		**4,533.863**	**4,533.863**	**4,173.863**

Table 6.6 – Direct investment for 275kV Plant Ancillaries

T12 - 110kV Plant Ancillaries

T12 - Scope of work

6.42 110kV substations require many ancillary systems to enable safe and reliable operation, these include:

- LV AC supply to run lighting, heating, battery charging and building services
- LV DC supply to run protection and communication systems
- Standby generator for emergency back up and black start services
- Water service for staff facilities
- Sewerage system (not in all substations)
- Drainage
- Security

6.43 During RP4 and RP5 a rolling programme of refurbishment and replacement of substation ancillary components was undertaken.

T12 - NIE Networks RP6 proposal

6.44 NIE Networks has set out is plans for investment in 110kV Plant Ancillaries in Section 10.2 of its RP6 Network Investment Plan beginning at paragraph 1604. These plans are summarised in Table 6.7

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Refurbish transformer bunds	Each	4	45.000	180.000
Replace standby generator	Each	16	29.971	479.537
Refurbish DC standby system	Lump Sum	1	410.665	410.665
Rewire AC system	Site	3	40.215	120.645
Replace 110kV CTs	Each	3	15.521	46.563
Refurbish S/S buildings	Site	1	200.000	200.000
Replace 110kV disconnector	Each	23	35.000	805.000
Refurbish/upgrade drainage	Site	1	25.000	25.000
				2,267.410

Table 6.7 – NIE Networks proposed investment in 110kV Plant Ancillaries

T12 – Draft determination

6.45 As with T11, we accepted the volumes and unit costs for all sub-programmes based on the fact that the total proposed amount is less than that allowed for RP5 when taken as annual spend per annum.

6.46 Most of the outputs defined in the RP5 final determination for this sub-programme were “Specified improvement at specified location(s)”. Unfortunately, NIE Networks’ RP5 business plan submission did not specify any volumes; subsequently we have limited data with which to form a comparison.

T12 – Final determination

6.47 NIE Networks made no comment on our draft determination.

6.48 After reviewing the 5 year outturn data we found that a reduction in four of the sub-programme allowances was warranted

6.49 We have based the RP6 final determination on the proposed RP6 volumes and the average outturn costs from RP5.

6.50 NIE Networks original proposal and our draft & final determinations of direct investment in RP6 for 110kV Ancillaries are shown in Table 6.8 (see Annex P for details of units of measure, volume and unit cost)

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
T12d	Refurbish transformer bunds	180.000	180.000	80.706
T12f	Replace standby generator	479.537	479.537	380.512
T12h	Refurbish DC standby system	410.665	410.665	270.814
T12i	Rewire AC system	120.645	120.645	107.275
T12n	Civil works	200.000	200.000	200.000
T12q	110kV Spare CTs	46.563	46.563	46.563
T12r	110kV Disconnector replacement	805.000	805.000	805.000
T12s	Drainage Upgrade	25.000	25.000	25.000
T12 Total		**2,267.410**	**2,267.410**	**1,915.870**

Table 6.8 – Determination of direct investment for 110kV Plant Ancillaries

T13 - 275/110kV Transformer Replacement

T13 - Scope of work

6.51 This programme of investment has been included in the RP6 submission to provide funding for NIE Networks to replace transmission transformer assets on its network due to condition. The population of assets within this investment category covers eighteen[32] 275/110 kV transformers located in transmission substations and includes their associated auxiliary systems

T13 - NIE Networks RP6 proposal

[32] Includes strategic spare currently located at Castlereagh

6.52 NIE Networks has set out is plans for investment in 275/110kV Transformer Replacement in Section 10.2 of its RP6 Network Investment Plan beginning at paragraph 1617. These plans are summarised in Table 6.9 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Transformers (275/110 kV) Buy & Install	Each	1	2,743.534	2,743.534
Transformers (275/110 kV) Install only	Each	2	602.062	1,204.124
Auxiliary Transformer Replacement	Each	4	59.708	238.832
Transformer Cooler Replacement	Each	2	125.000	250.000
				4,436.490

Table 6.9 – NIE Networks proposed investment in 275/110kV Transformer Replacement

6.53 In addition to the data included in the RP6 Network investment Plan and Annex, NIE Networks also provided details of the condition assessment and dissolved gas analysis (DGA) scoring of the transformers that are proposed to be replaced. (Hannahstown IBTX2, Castlereagh IBTX1 and Tandragee IBTX2)

6.54 NIE Networks also provided modelling based on the risk cost of the transmission transformer asset base using the Common Network Asset Indices Methodology (CNAIM).

T13 – Draft determination

6.55 We reviewed the initial data and the risk cost and asset age information presented and considered that the information did not strongly support the NIE Networks proposal of replacing three transformers in RP6 and two in RP7 over replacing two transformers in RP6 and three in RP7. Following a meeting held 1 February 2017 NIE Networks have provided additional supporting information:

i) Most recent oil analysis results for the three 275/110kV transformer units (total population of 18) which were proposed to be replaced (Hannahstown IBTX2, Castlereagh IBTX1 and Tandragee IBTX2). Most recent results are June 2016 with trending figure information for carbonic gasses

ii) Transformer scoring sheets (275_110kV%20Transformer%20Scoring.xlsx) for ten 275/110kV transformers which includes the originally provided summary table together with derivations for the scores which had not previously been provided and included a commentary of transformer condition.

6.56 Our conclusion from the review of the latest data is that there is still inadequate demonstration of the need for any specific transformer replacement. However we recognise that NIE Networks need a strategic approach for the replacement of these assets but do not consider that the current information favours replacement of three transformers in RP6 over two replacements.

6.57 Following discussion with UR, NIEN have revised their proposal to include only the installation of two transformers in the RP6 period. NIEN note that they do not have an outage plan from SONI at this stage for the three transformers that were originally identified for replacement. However, in removing a unit from the programme, they will manage the risk of failure by delaying the replacement of Hannahstown IBTX2 until the very end of RP6. (due to the long lead times in procuring a unit of this size, approximately. 1.5 - 2 years).

T13 – Final determination

6.58 NIE Networks made no comment on our draft determination and we have made no revisions for the final determination

6.59 NIE Networks original proposal and our draft & final determinations of direct investment in RP6 for 275kV transformer replacement are shown in Table 6.10 (see Annex P for details of units of measure, volume and unit cost)

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
T13a	Transformers (275/110 kV) Procure and Install	2,743.534	0.000	0.000
T13b	Transformers (275/110 kV) Install only	1,204.124	1,204.124	1,204.124
T13c	Auxiliary Transformer Replacement	238.832	238.832	238.832
T13d	Transformer Cooler Replacement	250.000	250.000	250.000
T13 Total		**4,436.490**	**1,692.956**	**1,692.956**

Table 6.10 – Direct investment in 275/110kV Transformer Replacement

T14 – 110/33kV Transformer Replacement

T14 - Scope of work

6.60 This programme of investment has been included in the RP6 submission to provide funding for NIE Network in order to replace transmission transformer assets on its network due to condition. The population of assets within this investment category covers 78N^{o} 110/33 kV transformers located in transmission substations and includes their associated auxiliary systems.

T14 - NIE Networks RP6 proposal

6.61 NIE Networks has set out its plans for investment in 110/33kV Transformer Replacement in Section 10.2 of its RP6 Network Investment Plan beginning at paragraph 1629. These plans are summarised in Table 6.11

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Install Transformer Only	Each	7	379.920	2,659.440
Procure Transformer Only	Each	6	681.000	4,086.000
Associated Cable Works	Lump Sum			1,670.000
Replace Earthing Transformer	Each	2	72.708	145.416
Replace Transformer Cooler	Each	7	125.000	875.000
				9,435.856

Table 6.11 – NIE Networks proposed investment in 110/33kV Transformer Replacement

6.62 NIE Networks propose to replace nine transformers (Ballymena Tx3, Ballymena Tx4, Banbridge Tx1, Banbridge Tx2, Banbridge TX3, Banbridge TX4, Enniskillen Tx1, Enniskillen Tx2 and Glengormley TXB) with seven transformers. The two transformers Bainbridge T3 and T4 will be managed off the system through the replacement of Bainbridge T1 and T2.

6.63 NIE Networks have the cost of one transformer funded in RP5 (this is 50% of the cost of purchasing the replacement for Ballymena Tx3 and Tx4). There is a system spare transformer at Donegal that that will be used as a rolling spare through the replacement programme leaving a system spare at the end of RP6. Hence the proposed plan to buy six transformers in RP6 and install seven.

6.64 NIE Networks have provided the most recent oil analysis results for nine of the 110/33kV transformer units which are proposed to be replaced. These are from June 2016 with trending figure information for carbonic gasses

6.65 Transformer scoring sheets have also been provided following request from UR which provides derivations for the condition scores which had not previously been provided.

6.66 NIE Networks considered three investment options:

- Option 1 – Replace 12 transformers with condition monitoring of the remaining population
- Option 2 – Replace 9 transformers and defer 3 transformers until RP7.
- Option 3 – Refurbish as an alternative to replacement.

6.67 NIE Networks concluded that Option 3 increased the risk to a level that NIE Networks could not accept, Option 1 is the least risk option but Option 2 was preferred from a cost perspective (and as the reduced number of outages would be easier to arrange with SONI) but would require greater focus on condition monitoring.

T14 – Draft determination

6.68 We have reviewed in detail the information provided by NIE Networks.

6.69 Whilst the additional DGA trend information provided by NIE Networks is supportive of the methodology adopted by NIE Networks, the detail does not demonstrate the

clear need for replacement of specific units in isolation. However we recognise the need for NIE Networks to have a strategic approach to replacement of these assets but given that the programme will take place throughout the RP6 period and into RP7 we do not consider that there is a need to fund the retention of a strategic spare in RP6 and we have reduced the expenditure accordingly.

6.70 We have reviewed the unit costs provided by NIE Networks and consider them to be in line with current industry norms.

6.71 It is noted that NIE Networks have not yet agreed an outage plan with SONi for the proposed works.

T14 – Final determination

6.72 NIE Networks made no comment on our draft determination.

6.73 After reviewing the 5 year outturn data we found that a reduction in one of the sub-programme allowances was warranted

6.74 For T14c (associated cable replacement) the 5 year outturn data supports a unit cost of £560k (total expenditure of £431k ÷ 5 year outturn x 6.5 year RP6 duration)

6.75 NIE Networks has since informed us that it plans to spend a total of £640k in RP5 on this sub-programme. This supports an allowance for RP6 of £747k. We decided to allow this amount based on the evidence provided.

6.76 NIE Networks original proposal and our draft & final determinations of direct investment in RP6 for 110/33kV transformer replacement are shown in Table 6.12 (see Annex P for details of units of measure, volume and unit cost)

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
T14a	Transformers (110/33 kV) Install only	2,659.440	2,659.440	2,659.440
T14b	Transformers (110/33 kV)Procure only	4,086.000	3,405.000	3,405.000
T14c	Associated cable replacement	1,670.000	1,670.000	746.666
T14d	Earthing Transformer Replacement	145.416	145.416	145.416
T14e	Transformer Cooler Replacement	875.000	875.000	875.000
T14 Total		**9,435.856**	**8,754.856**	**7,831.522**

Table 6.12 – Direct investment for 110/33kV Transformer Replacement

T15 22kV Reactor Replacement

T15 - Scope of work

6.77 Due to the fact that transmission lines and cables are naturally capacitive it is possible for the voltage at the remote ends of feeders to be higher than that of the source at times of low load.

6.78 In order to keep voltages within statutory limits, large inductors (reactors) are installed at strategic points on the system and are brought into service at times of lowest load to provide inductive reactance which counters the natural capacitive reactance of the system.

6.79 The reactors are installed on the 22kV tertiary windings of 275/110kV transformers at:

- Castlereagh IBT2
- Tandragee IBT1
- Tandragee IBT2
- Kells IBT1
- Kells IBT2
- Hannahstown IBT1
- Hannahstown IBT2

6.80 The reactors were originally installed between 1963 and 1979

T15 - NIE Networks RP6 proposal

6.81 NIE Networks has set out is plans for investment in 22kV Reactor Replacement in Section 10.2 of its RP6 Network Investment Plan beginning at paragraph 1642. These plans are summarised in Table 6.13 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Procure and install 22kV Reactors	Each	2	681.961	1,363.922
Procure 22kV Reactors only	Each	1	550.000	550.000
Replace Reactor Cooler	Each	1	47.000	47.000
				1,960.922

Table 6.13 – NIE Networks proposed investment in 22kV Reactor Replacement

T15 – Draft determination

6.82 We compared NIE Networks' RP6 proposal with their forecast outturn as no RIGs data has yet been submitted and no external comparative data is available.

6.83 We found the unit costs to be acceptable when compared to the RP5 allowances and forecast outturn unit costs. Taking into account the age of the originally installed reactors and the increasing risk of failure we also found the volume to be acceptable and the procurement of a spare reactor to be justified.

T15 – Final determination

6.84 NIE Networks made no comment on our draft determination and we have made no revisions for the final determination

6.85 NIE Networks original proposal and our draft & final determinations of direct investment in RP6 for 22kV reactors are shown in Table 6.14(see Annex P for details of units of measure, volume and unit cost)

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
T15a	22kV Reactors Buy & Install	1,363.922	1,363.922	1,363.922
T15b	22kV Reactors Procure only	550.000	550.000	550.000
T15c	Reactor Cooler Replacement	47.000	47.000	47.000
T15 Total		**1,960.922**	**1,960.922**	**1,960.922**

Table 6.14 – Direct investment in 22kV Reactor Replacement

T16 Transmission Transformer Refurbishment

T16 - Scope of work

6.86 NIE Networks has historically carried out refurbishment works on its fleet of 275/110kV and 110/33kV transformers. The works have generally focussed on:

- Bushing refurbishment/replacement
- Painting
- Tap changer repairs
- Disconnector refurbishment and spares

6.87 The purpose of the above works is to replace transformer and associated components to allow key items of plant to remain in service until they are no longer fit for purpose due to an unacceptable risk of failure or are deemed to be beyond economic repair.

T16 - NIE Networks RP6 proposal

6.88 NIE Networks has set out its plans for investment in Transmission Transformer Refurbishment in Section 10.2 of its RP6 Network Investment Plan beginning at paragraph 1657. These plans are summarised in Table 6.15 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Refurbish/Replace 275kV bushing	Each	3	30.924	92.772
Paint 275kV Plant	Site	4	10.512	42.048
Refurbish 275kV TX tap changer	Each	2	17.345	34.690
Refurbish 110kV cooler	Each	4	56.351	225.404
Replace 110kV Bushing	Each	18	15.446	278.028
Paint 110kV Plant	Site	9	7.880	70.920
Refurbish 110kV disconnector	Lump Sum	1	50.000	50.000
Refurbish 110kV TX tap changer	Each	4	13.780	55.120
PST Tap changer defect repair	Each	1	40.000	40.000
				888.982

Table 6.15 – NIE Networks proposed investment in Transmission Transformer Refurbishment

T16 – Draft determination

6.89 We compared NIE Networks' RP6 proposal with their forecast outturn as no volume data has been included in the RIGs submission and no external comparative data is available.

6.90 With the exception of 275kV plant painting and 110kV disconnector refurbishment all unit costs proposed for RP6 are below the RP5 forecast unit costs. In addition, the proposed annual average expenditure is £0.14m compared with an RP5 allowance of £0.22m and NIE Networks' RP5 forecast of £0.26m. We, therefore, accepted the volumes and unit costs for this programme.

T16 – Final determination

6.91 NIE Networks made no comment on our draft determination and we have made no revisions for the final determination

6.92 NIE Networks original proposal and our draft & final determinations of direct investment in RP6 for 22kV reactors are shown in Table 6.16 (see Annex P for details of units of measure, volume and unit cost)

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
T16a	275kV Bushing Refurbishment/Replacement	92.772	92.772	92.772
T16b	275kV Plant Painting	42.048	42.048	42.048
T16d	275kV TX tap changer refurbishment	34.690	34.690	34.690

Sub-programme	Description	NIE Proposed RP6 Cost (£k)	DD Allowance (£k)	FD Allowance (£k)
T16e	110kV Cooler replacements	225.404	225.404	225.404
T16f	110kV Bushings replacements	278.028	278.028	278.028
T16g	Plant Painting	70.920	70.920	70.920
T16h	Disconnector refurbishment	50.000	50.000	50.000
T16i	TX tap changer refurbishment	55.120	55.120	55.120
T16j	PST Tapchanger defect repair	40.000	40.000	40.000
T16 Total		**888.982**	**888.982**	**888.982**

Table 6.16 – Direct investment in Transmission Transformer Refurbishment

Transmission Overhead Lines

T17 – 275kV Transmission Overhead Line Asset Replacement

T17 - Scope of work

6.93 NIE Networks has included this project as a result of the deteriorated condition of many of the component elements that comprise the 275 kV overhead line network. The key issues cited by NIE Networks in their original submission included:

i) Eight failures of one or more line conductor sections on the Coolkeeragh PS – Magherafelt line have occurred between 2008 – 2016 with the overall remaining conductor lifetime indicated as being towards end RP5.

ii) Line conductor phase spacers have previously caused problems, particularly Bowthorpe metal-to-metal connections, which can cause chafing and result in broken conductor strands and ultimately a broken conductors.

iii) Conductor galloping has been an issue on a number of 275 kV circuits include Coolkeeragh PS – Magherafelt, Ballylumford PS – Hannahstown, Ballylumford PS – Magherafelt, Ballylumford PS - Kells and Tandragee – Louth circuits. This can lead to weakening of tension insulator sets resulting in subsequent failure.

iv) Around 20% of 275 kV overhead line tension and suspension insulators have yet to be replaced and are in poor condition.

v) The condition of overhead line tower steelwork is dependent on regular painting and replacement of damaged / corroded steel members. NIE Networks data indicates that around 19% of the tower population has steelwork condition such that painting alone would not be expected to increase remaining life and replacement steel sections will be required.

vi) Steel tower foundation protective paint is in generally poor condition. NIE Networks propose to carry out a number of surveys of tower foundation corrosion during RP6.

T17 - NIE Networks RP6 proposal

6.94 In relation to the proposed volumes of equipment presented in Table 6.17, NIE Networks are proposing to:

i) Replace all poor condition colour & number plates plus 50% of average condition plates, the latter being included to account for some average condition plates that will deteriorate in condition during the period.

ii) Perform line conductor spacers replacements relating to the Kilroot – Kells and Kilroot – Hillsborough 275 kV overhead lines.

iii) Replace 275 kV line insulators in poor condition as well as those on the Kilroot – Kells and Kilroot – Hillsborough lines which are over 40 years old.

iv) Perform samples on 10% of tower population for overall condition as well as foundation condition (only one leg per tower) during RP6 to better understand full remedial requirements.

v) Perform foundation muff repairs (separate from the detailed foundation condition assessment above) on 20% of towers during RP6 given that few have been assessed previously.

6.95 NIE Networks has set out its revised plans for investment in 275kV Transmission Overhead Line Asset Replacement in Section 2.10 of the NIE Networks Response Post Engagement and Queries – Part 2. These plans are summarised in Table 6.17 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Colour & No Plates	Each	310	0.595	184.450
Spacers	Site	502	1.100	552.200
Suspension Insulators	Each	390	3.597	1402.830
Tension Insulators	Each	112	11.240	1258.800
Tower Painting	Each	536	5.045	2704.120
Foundation Assessment	Site	124	3.000	372.000
Condition Assessment	Lump Sum			195.012
Trolley Inspection	Each	245	0.600	147.000
Foundation Muff Repair	Each	247	1.900	469.300
				7,285.712

Table 6.17 – NIE Networks proposed investment in Transmission Overhead Line Asset Replacement

T17 – Draft determination

6.96 We have reviewed the NIE Networks' submission information in detail provided.

6.97 Based on review of the latest supporting information, the proposed NIE Networks T17 work activity volumes are considered appropriate being substantiated with specific reference and commentary to supporting asset condition data.

6.98 Similarly, we have reviewed the revised plant unit costs provided by NIE Networks. These are also supported by reference to current contracted costs for the majority of activities and in some proposed RP6 unit costs are slightly lower than present RP5 outturns. We therefore consider the proposed NIE Networks unit costs to be reasonable and in line with industry norms.

6.99 Overall, the total proposed T17 work programme cost, which has been reduced by circa £561k from the initial submission, is considered reasonable.

T17 – Final determination

6.100 NIE Networks made no comment on our draft determination and we have made no revisions for the final determination

6.101 Our final determination of direct investment in RP6 and the associated outputs for Transmission Overhead Line Asset Replacement is shown in Table 6.18

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Allowance(£k)
Colour & No Plates	Each	310	0.595	184.450
Spacers	Site	502	1.100	552.200
Suspension Insulators	Each	390	3.597	1402.830
Tension Insulators	Each	112	11.240	1258.880
Tower Painting	Each	536	5.045	2704.120
Foundation Assessment	Site	124	3.000	372.000
Condition Assessment	Lump Sum			195.012
Trolley Inspection	Each	245	0.600	147.000
Foundation Muff Repair	Each	247	1.900	469.300
				7,285.792

Table 6.18 – Draft determination of direct investment and outputs for Transmission Overhead Line Asset Replacement

T19 – 110kV Transmission Overhead Line Asset Replacement

T19 - Scope of work

6.102 NIE Networks has included this project as a result of the deteriorated condition of many of the component elements that comprise the 110 kV overhead line network. The key issues cited by NIE Networks in their submission include:

i) A sizeable proportion of the 110 kV overhead line network has been the focus of refurbishment investments during RP4 and RP5. However, the remainder of the network has not seen significant refurbishment and consequently is in poor condition.

ii) A number of 110 kV overhead lines utilise Hardex type earthwire (containing an internal pilot wire) which is a redundant type of equipment. NIE Networks propose to replace all Hardex earthwire by the end of RP6.

iii) The condition of 110 kV overhead line conductors is generally considered to be acceptable and hence suitable for continued use through RP6. The exception is in relation to 30 specific span lengths on the Finaghy – Donegall and Castlereagh – Rosebank 110 kV circuits which have been identified for replacement.

iv) 110 kV wooden poles have seen replacement over previous regulatory period. However, NIE Networks data indicates around 582 wooden poles, predominantly those over 50 years old, are currently in a decayed state and require replacement during RP6. Further 110 kV wooden poles are also expected to reach a decayed state during RP6 and also require replacement.

v) The condition of overhead line tower steelwork is dependent on regular painting and replacement of damaged / corroded steel members. NIE Networks data indicates that around 16% of the tower population currently has steelwork condition such that painting alone would not be expected to increase remaining life and replacement steel sections will be required.

vi) Steel tower foundation protective paint is in generally poor condition. NIE Networks propose to carry out a number of surveys of tower foundation corrosion during RP6.

6.103 Note that the T19 work programme excludes the Ballylumford PS – Castlereagh 110 kV overhead line which is in particularly poor condition and consequently is the subject of a separate (T601) investment project.

T19 - NIE Networks RP6 proposal

6.104 In relation to the proposed volumes of equipment presented in Table 6.17, NIE Networks are proposing to:

i) Replace all poor condition colour & number plates plus 50% of average condition plates, the latter being included to account for some average condition plates that will deteriorate in condition during the period.

ii) Undertake replacement of 1,100 wooden pole sets that are, or expected to become decayed during RP6 along with a further 200 wooden poles that will be greater than 60 years old at the start of the RP6 period.

iii) Perform samples on 10% of tower population for overall condition as well as foundation condition (only one leg per tower) during RP6 to better understand full remedial requirements. Tower condition assessments will be performed largely via tower climbing and in some cases supported by drone or helicopter assessment.

iv) Replace the earthwire on the Ballylumford – Ballyvallagh and Eden – Kilroot 110 kV double circuit overhead lines.

v) Perform foundation muff repairs (separate from the detailed foundation condition assessment above) on 20% of double circuit towers during RP6 given that few have been assessed previously.

vi) Undertake tower painting on 571 double circuit and 202 single circuit 110 kV towers during RP6. This will add to the 553 towers that were addressed

during RP5 representing broadly three quarters of the total tower population where tower painting will have been undertaken over two price review periods.

6.105 NIE Networks has set out its plans for investment in 110 kV Transmission Overhead Line Asset Replacement in Section 2.11 of the NIE Networks Response Post Engagement and Queries – Part 2. These plans are summarised in Table 6.19 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Allowance(£k)
Replace conductor	Span	30	27.556	826.680
Replace colour and number plates	Each	248	0.600	148.800
Tower Painting	Site	773	1.906	1,473.338
Replace wood poles	Each	1,300	3.135	4,075.500
Foundation assessment	Each	178	3.000	534.000
Condition assessment	Lump Sum			154.518
Earthwire Replacement	Site	70	16.450	1,151.500
Muff repairs	Site	263	1.900	499.700
				8,864.036

Table 6.19 – NIE Networks proposed investment in Transmission Overhead Line Asset Replacement

T19 – Draft determination

6.106 We have review the NIE Networks submission information in detail including supplementary data provided through the clarification process.

6.107 Based on review of the submission information the proposed NIE Networks T19 work activity volumes are considered appropriate for the majority of T19 activities. Proposed work activity volumes have been substantiated with specific reference and commentary to supporting asset condition data.

6.108 The exception is in relation to proposed 110 kV wooden pole set replacements where we have been unable to identify a similar total volume requirement as per the NIE Networks submission by applying the same methodology. Using the NIE Networks methodology and the assets data provided in the business plan submission we derived a lower total volume of 1,170 replacement wooden pole sets. We have therefore based our assessed expenditure on this volume.

6.109 The submitted NIE Networks unit cost data has also been reviewed. Proposed plant / activity unit costs have therefore been confirmed as being reasonable and in line with industry norms with the exception of the proposed 110 kV earthwire replacement cost. Despite providing data to support claimed unit costs for other T19 work activities NIE Networks have provided little substantiation for their claimed unit cost rate despite stating that a bottom-up estimate has been used in deriving their proposed

value (£16,450 per span). This has not been provided as part of their submission. Therefore, we consider that the quoted cost for earthwire replacement is effectively a budgetary cost estimate which we consider will, in line with standard practice, include an element of cost safety margin for certain delivery elements, 10% being the norm. Consequently, we have reduced the unit cost for earthwire replacement by 10% to £14,805 per span.

T19 – Final determination

6.110 NIE Networks made no comment on our draft determination and we have made no revisions for the final determination

6.111 Our final determination of direct investment in RP6 and the associated outputs for Transmission Overhead Line Asset Replacement is shown in Table 6.20

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Allowance(£k)
Replace conductor	Span	30	27.556	826.680
Replace colour and number plates	Each	248	0.600	148.800
Tower Painting	Site	773	1.906	1,473.338
Replace wood poles	Each	1,170	3.135	3667.950
Foundation assessment	Each	178	3.000	534.000
Condition assessment	Lump Sum			154.518
Earthwire Replacement	Site	70	14.805	1,036.350
Muff repairs	Site	263	1.900	499.700
				8,341.336

Table 6.20 – Draft determination of direct investment and outputs for Transmission Overhead Line Asset Replacement

T20 – Transmission Cables

T20 - Scope of work

6.112 Prior to RP5, NIE Networks (and most GB DNOs) had taken a reactive approach to transmission cable management. However, as new technologies have progressed and have become more affordable DNOs are becoming more proactive.

6.113 Technologies which are becoming more prevalent are:

- Partial Discharge (PD) testing – trend analysis can help determine the condition of cable insulation
- Dodecylbenzene (DDB) – a modern synthetic insulating fluid used to supplement conventional mineral insulating oil. Provides improved dielectric performance.

- Perfluorocabon Tracer (PFT) – used to dope insulating fluid and can be detected at extremely low levels allowing small leaks on fluid filled cable to be easily detected.

T20 - NIE Networks RP6 proposal

6.114 NIE Networks has set out is plans for investment in Transmission Cables in Section 10.2 of its RP6 Network Investment Plan beginning at paragraph 1708. These plans are summarised in Table 6.21 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Replacement of Sheath Voltage Limiters	Each	9	5.357	48.213
110kV cable refurbishment	Lump Sum			273.471
Cable Flushing	M	9800	0.013	127.400
Transmission Cables Accessories and Ancillaries	Lump Sum			407.870
				856.954

Table 6.21 – NIE Networks proposed investment in Transmission Cables

T20 – Draft determination

6.115 We accepted the proposed volume of sheath voltage limiters as these replacements remove the last of the old, unreliable SVLs from the system. The proposed unit costs are lower than RP5 outturn therefore we accept.

6.116 The lump sum for cable refurbishment has been accepted based on the strong technical justification provided by NIE Networks.

6.117 During the query process NIE Networks provided further breakdown of costs associated with cable flushing. The additional data was sufficient justification for the increased unit costs in RP6 therefore we accepted.

6.118 Cable accessories and ancillaries is an ongoing programme to replace/refurbish key elements of the 110kV cable system. Given the strong technical justification provided by NIE Networks, we accept the continuation of this sub-programme.

T20 – Final determination

6.119 NIE Networks made no comment on our draft determination and we have made no revisions for the final determination

6.120 Our final determination of direct investment in RP6 and the associated outputs for Transmission Cables is shown in Table 6.22 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Allowance(£k)
Replacement of Sheath Voltage Limiters	Each	9	5.357	48.213
110kV cable refurbishment	Lump Sum			273.471
Cable Flushing	M	9800	0.013	127.400
Transmission Cables Accessories and Ancillaries	Lump Sum			407.870
				856.954

Table 6.22 – Draft determination of direct investment and outputs for Transmission Cables

T602 – Transmission Protection

T602 - Scope of work

6.121 The proposed investment covers three main equipment categories;

i) Electrical protection systems

ii) Control panels

iii) Substation monitors

6.122 Protection systems and monitoring equipment inherently have a shorter asset life than their associated switchgear and plant and therefore in addition to end of life replacement for switchgear and plant there is a requirement to replace protection system during the life of the associated switchgear and plant.

T602 - NIE Networks RP6 proposal

6.123 Electrical Protection Systems

i) NIE Networks has stated that replacement of protection systems covering four main technology types is required:

- Electromechanical protection systems – most of the devices on the system are more than 40 years old, so well past the typical design life of 30 years. Although the systems have been generally reliable, more recently there has been evidence of deterioration and the technology is now obsolete.
- Static technology relays – these relays will be over 25 years old during RP6, so can be considered obsolete. Spares will be limited and there is no ongoing original manufacturer support. Equipment failures have been reported in recent years.
- Early digital protection – these protection devices will also be over 25 years during RP6 so can be considered obsolete, without support from the original manufacturer.

- Unit protection schemes – the need for investment is driven by equipment reliability issues. The technology is also no longer supported by the original manufacturer.

ii) Given the critical nature of protection systems for successful network operation, NIE Networks consider that replacement of the systems is required to prevent deterioration of the network leading to system stability and safety issues, along with a need to reduce the risk of damage to the network that could cause significant impact on customer service levels.

iii) In determining the investment requirement NIE Networks presented options for replacing all units identified as in need of replacement in RP6 and also an option to defer a proportion until RP7. NIE Networks determined that the deferment option was preferred and provides a number of spares that can be used to manage the population that remains into RP7.

iv) Costs are based on current contract prices.

6.124 Control Panels

i) NIE Networks state they have identified two control panels for replacement. This assessment has been based upon failed control switches and relays.

ii) Due to these discrete equipment failures, NIE Networks cannot operate certain items of plant remotely. This lack of remote control and operation can cause post-fault restoration delays causing unnecessary system disruption.

iii) Costs are based on current contract prices.

6.125 Substation Monitors

i) The existing substation monitors were installed in the late 1980's and 1990's. The primary function of the monitor was to act as a Fault Recorder for post-fault data investigation and analysis. NIE Networks state that the monitors are now obsolete and in poor condition with several no longer able to function correctly.

ii) Modern networks now require a wide range of information that cannot be obtained from the existing monitors, mainly related to power quality issues. NIE Networks therefore consider that the investment is required to both replace the obsolete and mal-functioning monitors, and also increase the data available for post-fault investigation and power quality monitoring.

iii) NIE Networks considered options of replacing the proposed 30 monitors against just replacing monitors on one side of a 275kV circuit. This would allow deferring a number of replacements until RP7. It was determined that due to the critical nature of the 275kV network and the impact that one fault can have on the entire network, it is essential that NIE Networks and SONI have access to recorded information on faults to carry out effective investigation and so the option to replace the 30 monitors was chosen.

iv) Costs are based on current contract prices.

6.126 NIE Networks has set out its plans for investment in Transmission Protection in Section 10.2 of its RP6 Network Investment Plan beginning at paragraph 1773. Further detailed volumes and costs were provided in response to query URQ031a. These plans are summarised in Table 6.23 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
275kV Protection				
275kV Buszone (5 Zone)	Each	1	87.000	87.000
275kV Buscoupler	Each	3	13.500	40.500
275KV Control Panel	Each	2	117.538	235.076
275kV Buszone (3 Zone)	Each	2	55.800	111.600
Interbus Transformer Protection	Each	5	61.250	306.250
Mesh Corner	Each	2	14.600	29.200
275KV Group Alarms	Each	5	24.324	121.618
275kV Feeder Protection	Each	20	71.113	1,422.260
OCEF Gen Prot	Each	2	24.000	48.000
Circuit Breaker Fail	Each	23	7.163	164.749
22kV Reactors	Each	4	24.000	96.000
Strategic Spare Relays	-	-		50.000
275kV Protection Total				**2,712.253**
110kV Protection				
110kV Buszone Protection (4 Zone)	Each	12	15.000	180.000
Group Alarms	Each	3	42.292	126.876
Transformer Protection	Each	6	31.300	187.800
Distance Protection	Each	8	32.225	257.800
Tap Change Control	Each	6	12.025	72.150
Combined Transformer Protection and Tap Changer	Each	1	77.200	77.200
Load Shedding (Relay Change Only and Minor Wiring	Each	7	3.625	25.375
Unit Protection (3 end scheme)	Each	12	26.625	319.500
Unit Protection	Each	2	31.575	63.150
Intertripping	Each	2	16.750	33.500
Computer Based Alarm Panel	Each	1	11.500	11.500
Load Shedding Panel	Each	2	9.113	18.226
Strategic Spare Relays	-	-		50.000
110kV Protection Total				**1,423.077**
Substation Monitors				
Grid 275kV	Each	15	25.873	388.095

Grid 110kV	Each	9	25.232	227.088
Main 110kV	Each	6	26.850	161.100
Substation Monitors Total				**776.283**
Transmission Protection Total				**4,911.613**

Table 6.23 – NIE Networks proposed investment in Transmission Protection

T602 – Draft determination

6.127 We have reviewed the information provided by NIE Networks and clarified the volumes and costs through question and answer sessions.

6.128 We consider that there is a clear current need for the T602 work programme.

6.129 The volume of the potential work requirements during RP6 has been adequately defined and the requested volumes are appropriate.

6.130 We have reviewed the costs and find them in line with industry norms.

6.131 We have confirmed that that protection costs are not included under plant specific items and are apportioned under discrete protection allowances, thereby removing the potential for overlap of allowances across equipment categories.

6.132 We disallowed the cost for strategic spares with no defined volumes (£100,000) owing to lack of justification in the Business Plan.

T602 – Final determination

6.133 NIE Networks made no comment on our draft determination and we have made no revisions for the final determination

6.134 Our final determination of direct investment in RP6 and the associated outputs for Transmission Protection is shown in Table 6.24

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Allowance(£k)
275kV Protection				
275kV Buszone (5 Zone)	Each	1	87.000	87.000
275kV Buscoupler	Each	3	13.500	40.500
275KV Control Panel	Each	2	117.538	235.076
275kV Buszone (3 Zone)	Each	2	55.800	111.600
Interbus Transformer Protection	Each	5	61.250	306.250
Mesh Corner	Each	2	14.600	29.200
275KV Group Alarms	Each	5	24.324	121.618
275kV Feeder Protection	Each	20	71.113	1,422.260

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Allowance(£k)
OCEF Gen Prot	Each	2	24.000	48.000
Circuit Breaker Fail	Each	23	7.163	164.749
22kV Reactors	Each	4	24.000	96.000
275kV Protection Total				**2,662.253**
110kV Protection				
110kV Buszone Protection (4 Zone)	Each	12	15.000	180.000
Group Alarms	Each	3	42.292	126.876
Transformer Protection	Each	6	31.300	187.800
Distance Protection	Each	8	32.225	257.800
Tap Change Control	Each	6	12.025	72.150
Combined Transformer Protection and Tap Changer	Each	1	77.200	77.200
Load Shedding (Relay Change Only and Minor Wiring	Each	7	3.625	25.375
Unit Protection (3 end scheme)	Each	12	26.625	319.500
Unit Protection	Each	2	31.575	63.150
Intertripping	Each	2	16.750	33.500
Computer Based Alarm Panel	Each	1	11.500	11.500
Load Shedding Panel	Each	2	9.113	18.226
110kV Protection Total				**1,373.077**
Substation Monitors				
Grid 275kV	Each	15	25.873	388.095
Grid 110kV	Each	9	25.232	227.088
Main 110kV	Each	6	26.850	161.100
Substation Monitors Total				**776.29**
Transmission Protection Total				**4,811.613**

Table 6.24 – direct investment and outputs for Transmission Protection

T603 Scope of work

6.135 At the outset of RP5 NIE Networks outsourced all operational activities to their subsidiary, NIE Powerteam. Part of NIE Networks' related party costs was a payment to NIE Powerteam called the "Managed Service Charge" (MSC). This transaction covered the costs of NIE Powerteam's technical engineers and "ops and outage".

6.136 Basically, the above cost categories were NIE Powerteam's costs for:

- commissioning new network components,
- routine system testing,
- fault location, and
- switching operations to allow access to the network

6.137 NIE Networks reorganised their operations during RP5 and absorbed NIE Powerteam into the core business. Although the transaction between NIE Networks and NIE Powerteam ceased, the costs covered by the MSC still exist within the core business.

6.138

T603 NIE Networks RP6 proposal

6.139 NIE Networks has set out its plans for investment in Distribution Network Access and Commissioning in Section 6.6 of its RP6 Network Investment Plan beginning at paragraph 1137. These plans are summarised in Table 6.25 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Network Access & Commissioning	Lump Sum			1,305.000

Table 6.25 – NIE Networks proposed investment in Network Access and Commissioning

T603 Draft determination

6.140 We calculated an allowance based on reported outturn expenditure between 2012/13 and 2015/16 extrapolated for the RP6 price control duration. When compared to our calculated figure the NIE Networks proposal was deemed to be acceptable.

T603 Final determination

6.141 NIE Networks made no comment on our draft determination and we have made no revisions for the final determination

6.142 Our final determination of direct investment in RP6 transmission network access and commissioning is shown in Table 6.26

Sub-programme	Description	UoM	FD allowance(£k)
T603a	Network Access & Commissioning	Lump Sum	1,305.000

Table 6.26 – Direct investment in Network Access and Commissioning

7 T40 – Transmission ESQCR

T40 - Scope of work

7.1 The works for transmission ESQCR fall into the same categories as distribution. The works in RP6 include:

i) addressing the signs and anti-climbing guards as required by 2022;

ii) completing a programme to address the risks associated with Very High Risk sites; and

iii) commencing the programme of additional remedial works addressing clearances.

7.2 It is expected that all of these will be addressed by enhanced signage and climbing guards.

T40 - NIE Networks RP6 proposal

7.3 NIE Networks has set out is plans for investment in Transmission ESQCR in Section 11 of its RP6 Network Investment Plan. These plans are summarised in Table 7.1 below.

Sub-programme	UoM	Volume	Unit Cost (£k)	Total Direct Proposal(£k)
Transmission ESQCR	Lump Sum			165.128

Table 7.1 – NIE Networks proposed investment in Transmission ESQCR

T40 – Draft determination

7.4 We are satisfied that the proposal is based on the population of 110kV and 275kV towers and that the proposed costs have been calculated based on the remedial works arising from trial samples undertaken in RP5.

7.5 The funding is allowed on the basis of the transmission network being ESQCR compliant within the timeframe stated in the legislation and that no further funding will be allowed for these works with the exception of business as usual maintenance.

T40 – Final determination

7.6 NIE Networks made no comment on our draft determination and we have made no revisions for the final determination

7.7 Our final determination of direct investment in RP6 for Transmission ESQCR is shown in Table 7.2 below.

Sub-programme	Description	UoM	FD Allowance(£k)
T40a	Transmission ESQCR	Lump Sum	165.128

Table 7.2 – Direct investment for Transmission ESQCR

8 Transmission – Potential Additional Investment

Overview

8.1 NIE Network highlighted the potential for a material amount of additional investment in RP6 to improve the capacity or capability of the transmission network. This includes:

i) strategic projects such as the North South interconnector necessary to enhance security of supply and facilitate the energy market across the island of Ireland;

ii) local reinforcement of the transmission network to cater for load growth; and,

iii) reinforcement to secure the dispatch of energy from wind farms and reduce the risk of curtailment of generation capacity.

8.2 NIE Networks is not responsible for developing, designing and promoting these projects. This is the role of the Transmission Systems Operator (TSO), SONI. NIE Networks' responsibility is to procure and construct the projects once SONI has completed its work and handed the project over to NIE Networks for delivery. NIE Networks funds the investment and the efficient cost of investment is recovered from consumers through tariffs net of any contributions received.

8.3 In RP5, investment necessary to improve the capacity or capability of the transmission network was approved on a case by case under the 'D5' mechanism which formed part of the Competition Commissions 'Price Control Design'. We have set out our intention to continue with this 'D5' mechanism for RP6. As a result, our determination does not commit to an allowance for this type of project. However, as the level of investment is expected to be material, we have taken account of information provided by NIE Networks and SONI and our own estimates to include an estimate value in tariff modelling for RP6 to ensure that the impact on tariffs of the potential scale of investment is clear to consumers.

NIE Networks submission

8.4 In its submission, the company provided an itemised list and description of potential additional transmission investment.[33]

8.5 The company indicated that the total value of the list of projects was in excess of £250m but it anticipated that the amount that will be incurred during RP6 will be considerably less than this amount due to:

[33] NIE Networks Business Plan submission, Chapter 10.

i) the validation of the case of need and optimal solution for each project;

ii) the pace at which SONI is able to progress the necessary pre construction, taking account in particular of the uncertainties around securing landowner and statutory permissions; and

iii) the level of expenditure incurred on the construction of the proposed North South Interconnector.

8.6 The company did not include an allowance for these projects in the financial submissions or tariff modelling included in its Business Plan.

Engagement with SONI

8.7 We asked SONI, which is responsible for developing, designing and promoting these projects, for its current best estimate of the costs of these projects and the annual profile of expenditure.

8.8 SONI's current best estimate of all projects which are likely to progress in RP6 was £259m. It suggested that a potential lower end of the capex range was £230m. SONI caveated its response to us highlighting uncertainties over need, optimal solution development, cost estimates and potential delays to project start dates as projects are taken through their development, planning and land acquisition stages.

Assessment of potential additional transmission investment

8.9 We reviewed the status of the projects identified by NIE Networks and SONI against the Ten Year Transmission Forecast Statement (TYTFS) produced by SONI. Based on the high level project descriptions and the TYTFS, we confirmed that the order of magnitude of the additional costs provided by SONI was reasonable.

8.10 We note the caveats expressed by SONI, the general difficulties of promoting major projects, and our experience to date of the small volume of limited additional transmission investment which has progressed to construction to date. We are also cognisant of the significant investment required in the North South interconnector which will underpin additional transmission investment in RP6.

8.11 Taking account of the estimates of potential future investment, we have concluded that it would be reasonable to assess the impact of an additional £200m of investment to increase the capacity of the transmission network in our financial modelling for RP6.

8.12 The inclusion of this estimated additional investment in our financial modelling does not constitute an ex ante allowance within our RP6 determination. The efficient cost of additional transmission investment will continue to be funded through allowances determined under the D5 mechanism.